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General practitioners' attitudes, beliefs and behaviours regarding exercise for chronic knee pain

Elizabeth Cottrell

Doctor of Philosophy

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Keele University

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Research Institute	**Primary Care and Health Sciences**
Name of Lead Supervisor	**Dr Edward Roddy**

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Abstract

Patients with chronic knee pain (CKP) frequently present to general practitioners (GPs). Exercise, a core management approach for CKP, reduces pain and improves functioning. To maximise patient outcomes, GPs should practise in line with best evidence recommendations. Using an underpinning model (developed using behavioural theory), this thesis describes the attitudes, beliefs and behaviours of GPs regarding the use of exercise for patients with CKP.

A systematic review revealed a paucity of published studies specifically examining this topic. Available data suggested that GPs' attitudes and beliefs about exercise for CKP varied widely, exercise appeared to be underused and its implementation by GPs was unclear. The need to concurrently and specifically investigate the attitudes, beliefs and behaviours of GPs regarding exercise for CKP was identified.

A vignette-based pilot questionnaire survey of 800 UK GPs was undertaken to refine the survey tool and methods and to inform the required sample size for the main survey. The subsequent main survey of 5000 UK GPs revealed that exercise was used by most GPs for CKP. However, methods employed to initiate exercise within an individual patient's management plan were variable and imperfectly aligned with evidence-based recommendations. Attitudes and beliefs about exercise for CKP were generally positive; however GPs expressed some uncertainty about safety and efficacy, particularly regarding local exercise (e.g. strengthening, range-of-movement, stretching). Although some elements of the underpinning model (e.g. role and identity) predicted GPs' behaviour, others (e.g. beliefs about capabilities) performed less well.

To maximise the clinical outcomes of patients with CKP, recommendations from this research include: development of educational, organisational change and/or

behaviour change strategies to improve initiation of individualised exercise, and clarification of GPs' role, in this context. Approaches to better understand the key influences on GPs' behaviour are required; a greater focus on decision-making theory may be valuable.

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Abbreviations

AAOS = American Academy of Orthopaedic Surgeons

ABC-Knee (study) = Attitudes and Beliefs Concerning Knee pain

AbQ = abbreviated questionnaire

APEX (trial) = Acupuncture, Physiotherapy and Exercise

BMI = body mass index

CASP = Critical Appraisal Skills Programme

CCG = clinical commissioning group

CI = confidence interval

CKP = chronic knee pain

COX-2 = cyclooxygenase-2

CPD = continuing professional development

CRD = Centre for Reviews and Dissemination

CSP = Chartered Society of Physiotherapists

CT = computed tomography

DoH = Department of Health

DPT = dual process theory

ESR = erythrocyte sedimentation rate

EULAR = European League Against Rheumatism

GMC = General Medical Council

GP = general practitioner

GPS = global positioning system

GPwSI = general practitioner with special interests

HBM = health belief model

HCP = healthcare professional

HT = health trainer

LBP = low back pain

LTC = long term condition

MDS = minimum data set

MI = motivational interviewing

MRI = magnetic resonance imaging

NCAW = Newcastle critical appraisal worksheet

NCF = necessity-concern framework

NHS = National Health Service

NICE = National Institute for Health and Clinical Excellence

NSAID = non-steroidal anti-inflammatory drug

OA = osteoarthritis OARSI = Osteoarthritis Research Society International

PCP = primary care physician

PMR = polymyalgia rheumatic

PMT = protection motivation theory

PN = practice nurse

PPI = proton pump inhibitor

QOF = Quality and Outcomes Framework

RCGP = Royal College of General Practitioners

RCT = randomised controlled trial

R&D = research and development

RF = rheumatoid factor

RIPCHS = Research Institute of Primary Care and Health Sciences

SD = standard deviation

SDT = self-determination theory

SIGN = Scottish Intercollegiate Guideline Network

StQ = standard questionnaire

SUA = serum uric acid

SYSADOA = glucosamine, chondroitin, diacerein, avocado-soya unsaponifiables

TAM = technology acceptance model

TDF = theoretical domains framework

TENS = transcutaneous electrical nerve stimulation

TIB = theory of interpersonal behaviour

TKR = total knee replacement

TPB = theory of planned behaviour

UK = United Kingdom

WD = withdrawn

WHO = World Health Organisation

WOMAC = Western Ontario and McMaster Universities Osteoarthritis Index

Research outputs relating to this thesis

Peer-reviewed publications

Cottrell E, Roddy E, Foster NE. The attitudes, beliefs and behaviours of GPs regarding exercise for chronic knee pain: a systematic review. *BMC Family Practice*. 2010; 11: 4. (Highly Accessed)

Cottrell E, Roddy E, Rathod T, Thomas E, Porcheret M, Foster NE. Maximising response from GPs to questionnaire surveys: do length or incentives make a difference? *BMC Medical Research Methodology*. 2015;15:3.

Oral presentations

Cottrell E, Roddy E, Foster N. A systematic review of the attitudes, beliefs and behaviours of GPs regarding exercise for chronic knee pain. Society of Academic Primary Care Annual Conference: Galway; July 2008.

Cottrell E, Roddy E, Foster N, Porcheret M. A systematic review of the attitudes, beliefs and behaviours of GPs regarding exercise for chronic knee pain. Royal College of General Practitioners (Midland Faculty) Annual Research Meeting: Coventry; June 2009.

Cottrell E, Roddy E, Porcheret M, Thomas E, Rathod T, Foster NE. Role of the GP in managing chronic knee pain: preliminary results from a national pilot survey. SAPC North Division Annual Conference: Kendal; November 2013.

Cottrell E. Role of the GP in managing chronic knee pain. Annual General Practice Academic Clinical Fellow conference: Oxford; April 2014.

Cottrell E. Investigating GPs' attitudes, beliefs and behaviours about exercise for chronic knee pain: from pilot to main survey. Institute for Primary Care and Health Sciences Postgraduate Symposium: Keele; May 2014.

Cottrell E. General practitioners' use of exercise for chronic knee pain: a national cross-sectional survey. Institute for Primary Care and Health Sciences Postgraduate Symposium: Keele; May 2015.

Poster presentations

Cottrell E, Rathod T, Thomas E, Foster N, Porcheret M, Roddy E. Maximising data quality from GP surveys: effect of questionnaire length and incentives on response rate. Annual General Practice Academic Clinical Fellow conference: Birmingham; January 2013.

Cottrell E, Rathod T, Roddy E, Porcheret M, Thomas E, Foster NE. Effect of question format on general practitioner response: results from a national pilot survey. RCGP Annual Primary Care Conference: Harrogate; October 2013.

Cottrell E, Porcheret M, Roddy E, Thomas E, Rathod T, Foster NE. Targeting treatment for chronic knee pain: preliminary results from a national cross-sectional pilot GP questionnaire survey. RCGP Annual Primary Care Conference: Harrogate; October 2013.

Cottrell E, Thomas E, Porcheret M, Rathod T, Roddy E, Foster NE. Awareness and attitudes of GPs about the NICE osteoarthritis guideline: preliminary results from a national pilot survey. SAPC North Division Annual Conference: Kendal; November 2013.

Cottrell E, Porcheret M, Roddy E, Thomas E, Rathod T, Foster NE. Targeting treatment for chronic knee pain: preliminary results from a national cross-sectional pilot GP questionnaire survey. Annual General Practice Academic Clinical Fellow conference: Oxford; April 2014.

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Cottrell E, Roddy E, Rathod T, Porcheret M, Foster NE. Exercise for chronic knee pain: a national cross-sectional questionnaire survey of GPs in the UK. OARSI 31st March- 3rd April 2016; Amsterdam, Netherlands.

Cottrell E, Roddy E, Rathod T, Porcheret M, Foster NE. Exercise for chronic knee pain: a national cross-sectional questionnaire survey of GPs in the UK. Annual Midlands Academy of Medical Sciences Research Festival 15th April 2016; Leicester, UK.

1 Introduction

This PhD investigates the attitudes, beliefs and behaviours of general practitioners (GPs) regarding exercise for chronic knee pain (CKP). To contextualise this, the definition, impact, and clinical management of CKP are first summarised before introducing the primary topic.

1.1 Definition, nature and impact of chronic knee pain

CKP can be defined as '*mechanical knee pain, with or without loss of function, and with or without radiographic changes consistent with knee osteoarthritis (OA), that has lasted for at least three months*' (1). It applies to adults aged 45 years or older, and is synonymous with clinical knee OA (2). Knee OA is considered a whole joint disease which is characterised by synovial, ligament and subchondral bone inflammation, cartilage degradation, quadriceps muscle weakness and bone remodelling (2-6). Pathophysiologically, knee OA results from an imbalance between micro- and/or macro-traumas and reparative processes (2). Alterations to the shape, alignment or function of the cartilage, muscle and/or ligaments change the biomechanics within the joint, '*mechanopathology*' (3), and result in aberrant loading through the joint. Initially, gross structural changes may be imperceptible and/or asymptomatic. However, if the mechanopathology remains and/or reparative processes cannot match the persisting or recurrent inflammation and damage, a cycle of decreasing muscle strength, abnormal loading and further damage ensues. This eventually results in observable structural abnormalities, caused by both damage and aberrant remodelling, with or without associated symptoms (2-4). Because the development of OA is dynamic and symptoms poorly correlate with observable structural change (3), it is now defined as a chronic pain syndrome, rather than by its pathological features (7). Therefore, viewing CKP as synonymous

with clinical knee OA is appropriate for this PhD as patients presenting to general practice usually consult with symptoms such as pain, stiffness and reduced mobility and function, the symptoms that are most amenable to improvement by exercise (8). In light of this, the term CKP will be used throughout this thesis to refer to either clinical knee OA or CKP.

CKP is common among older adults. Lifetime risk of CKP is estimated at 40-47%, with even greater risk observed among those who are obese (9). Annually, around 25% adults aged over 50 years old experience knee pain lasting over a month (10-12) and 33% of people over 65 years old have CKP (13). CKP significantly impacts the daily life and general health of patients (14). Local effects of CKP include 'pain, swelling, limited range of motion, muscle weakness and postural or gait instability' (15) and can result in functional limitation and disability (10,16,17). The onset is often insidious (16,18) and patients can experience gradual or sudden fluctuations in their condition over time, with or without identifiable triggers (19). Prognosis is variable, from little alteration in pain, function or structural changes in the joint through to progressive deterioration (3). One-third of people with CKP will report less pain after two years (7).

The wider impacts of CKP include fatigue (20), reduced cardiovascular fitness and, particularly among sedentary patients or those with walking difficulty, increased mortality (15,21). Quality of life is impaired by this type of joint pain (22), particularly among patients reporting mental distress (23) and falls (24). Prevalence of depression is high among patients with CKP, particularly those with severe pain (25). CKP also impacts wider society through occupational factors such as lost work days, inability to function while at work and/or the need to take early retirement, and social factors such as reduced capacity to fulfil social roles (13,14,17,26).

CKP has both modifiable and non-modifiable risk factors, many of which lead to increased loading to part or all of the joint, trauma to the knee joint (leading to direct damage or abnormal loading) and malalignment, see Table 1-1 (2,3,26-31). Considering these risk factors, CKP has been predicted to become an increasing problem over future years (32).

Table 1-1 Risk factors for CKP

Risk factors	Further information
Non-modifiable	
Age	Prevalence and incidence increases with age, but may plateau at age 80 years
Gender	CKP is more likely and has increased severity among females
Ethnicity	Slightly greater prevalence in Chinese and African Americans compared to Caucasian women
Heritability	Up to 50% of cases have a heritable component (after adjusting for age/weight)
Radiographic changes	Patients with severe radiographic OA changes are more likely to report pain but radiographic changes do not consistently predict symptoms
Modifiable	
Overweight and obesity	Significant risk factor, in a population where 25% of patients are obese it is estimated that 29% of cases of CKP could be prevented by reducing BMI from >30 to <25. Increasing BMI over adulthood may be more risky than being consistently overweight during adulthood and obesity appears to increase progression to arthroplasty
Injury	One of the strongest risk factors, in particular, transarticular fracture, meniscal tear requiring meniscectomy, or anterior cruciate ligament injury
Occupation	Increased risk from jobs involving lifting and/or carrying, kneeling, squatting, climbing steps and prolonged standing (>2 hours/day), for example; farming, construction work and teaching physical education
Physical activity/sport	Elite long distance runners and soccer players may be at risk. However, there is inconsistent evidence about recreational activities; while vigorous, strenuous or intense levels of activity may increase the risk, habitual levels of activity do not appear to confer a risk
Bone mineral density	Increased bone mineral density appears to be related to development but low bone density is associated with progression of symptoms, however this may be a result (rather than a cause) of progression
Depression or poor mental health	May be a risk factor for increased symptoms

BMI = body mass index; CKP = chronic knee pain. Taken from Spector et al 1996 (27), Felson 2009 (3), Zhang & Jordan 2010 (26), Blagojevic et al 2010 (28), Sowers & Karvonen-Gutierrez 2010 (29), Zhang 2010 (30), Zhang et al 2011 (31), Neogi & Zhang 2013 (9), National Clinical Guideline Centre 2014 (2) and Barbour et al 2014 (33)

1.2 Diagnosis and clinical management of CKP

Before providing a more focused introduction of the primary topic, GPs' use of exercise for CKP, the general approach to diagnosing and managing CKP is now summarised.

1.2.1 Diagnosis

It is recommended that a clinical diagnosis of CKP does not require investigations in the presence of activity-related joint pain, in patients aged 45 years or older, when there is little (<30 minutes) or no early morning stiffness, no atypical or 'red flag' features and no other suspected pathology (2,34-36). Red flag features that should prompt consideration of other diagnoses (e.g. fracture, crystal arthritis, inflammatory arthritis, infection and malignancy) include a recent history of trauma, prolonged morning stiffness, rapidly worsening symptoms and a hot swollen joint (2). Imaging is recommended only as an adjunct to history taking and examination (2,34). Although radiographic changes are more likely when symptoms or functional limitations are persistent and/or severe (2,37), the value of radiographs among patients with typical CKP symptoms is limited by the inexact correlation between symptoms and radiographic changes (7,38-40). Blood tests will also not aid the diagnosis of typical CKP and are not recommended in guidelines (2).

1.2.2 Clinical management

Currently, curative treatments for CKP are still under investigation; for example stem cell implantation and disease modifying OA drugs (41). Therefore, the primary goal of current clinical management is to reduce or control pain, maintain or improve joint mobility, limit functional impairment, improve quality of life, address modifiable prognostic factors and minimise harms caused by treatment (15,42,43). Iatrogenic harm can be minimised, for example, through avoiding first-line, high dose and/or prolonged use of oral non-steroidal anti-inflammatory drugs (NSAIDS), which can convey substantial cardiovascular and gastrointestinal risks (44,45). Avoiding opioids is also advised during first-line management (2), as these also have

troublesome side-effects and have greater risks to morbidity and mortality than NSAIDs (46).

Many international guidelines have been developed to support clinical management of CKP; Appendix 1 contains a summary of a selection of recent guidelines. The most recent UK guidelines were published by the National Institute for Health and Care Excellence (NICE) (2). Consistent with other available guidance, NICE recommend exercise, weight loss and education as 'core' treatments (see Appendix 1). In general, over the last 20 years, the recommendation to manage CKP using exercise has been consistent and there has been an increasing emphasis on non-pharmacological, self-management and educational strategies. The 2013 European League Against Rheumatism (EULAR) guidelines marked a further shift from provision of stark management recommendations to a more pragmatic step-by-step approach to assist healthcare professionals (HCPs) to use best practice recommendations. For example, these guidelines set out a menu of suggested exercise interventions, suggested techniques for supporting patients in sustaining behaviour change and recommended consideration of wider aspects such as work disability (47).

Although weight loss and self-management education are recommended core treatments for patients with CKP, it is beyond the scope of this thesis to detail the evidence underlying all recommended treatments for CKP. A summary of key treatment recommendations is provided in Table 1-2, before focusing on the primary issue for this PhD, the use of exercise for CKP among GPs.

Table 1-2 A summary of NICE treatment recommendations for CKP

Core treatments	Adjunct to core treatments		Not recommended by NICE
	First line	Second line	
Weight loss (if overweight or obese) Education to support self-management – including advice on footwear Exercise	Local heat or cold TENS Assessment for bracing/joint supports/insoles if instability Assistive devices – e.g. walking sticks Paracetamol Topical NSAIDs Topical capsaicin	Oral NSAIDS (co-prescribed with PPI) COX-2 inhibitors (co-prescribed with PPI) Opioids	Glucosamine or chondroitin Rubefacients Tricyclic agents (for pain) Intra-articular hyaluronan injections Acupuncture* Arthroscopy lavage and debridement (unless history of mechanical locking)
	Intra-articular corticosteroid injections (if moderate to severe pain) Referral for knee replacement surgery (if symptoms have substantial impact on their quality of life and are refractory to non-surgical treatment)		
Follow-up for all patients with symptomatic OA**			

*Amended in 2014 guidelines (44) – previously 'electro-acupuncture' not recommended for use (48); **New in 2014 guidelines (44). COX-2 = cyclooxygenase-2 inhibitors, NSAID = non-steroidal anti-inflammatory drug, OA = osteoarthritis, PPI = proton pump inhibitor, TENS = transcutaneous electrical nerve stimulation

1.2.2.1 Exercise as core treatment

Exercise is defined as a form of physical activity. Physical activity is defined as '*any bodily movement produced by skeletal muscles that requires energy expenditure….[it] includes exercise as well as other activities which involve bodily movement and are done as part of playing, working, active transportation, house chores and recreational activities*' (49). Exercise is '*a subcategory of physical activity that is planned, structured, repetitive, and purposeful in the sense that the improvement or maintenance of one or more components of physical fitness is the objective*' (49). Over the course of a week, all adults are advised to do at least 150 minutes of moderate-intensity aerobic activity, and muscle strengthening exercises of all major muscle groups on at least two days (49).

Specific to CKP, Roddy et al (50) published the MOVE consensus recommendations in 2005 which were designed to help HCPs to initiate exercise in to the management of a patient with lower limb OA. Using the Delphi technique, a multidisciplinary guideline development group (rheumatologists n=10, physiotherapists n=4, GP n=2, evidence-based medicine experts n=2, medicine for the elderly physician n=1, health psychologist n=1) developed ten propositions regarding the role of exercise for lower limb OA (derived from ten suggestions from each member) and the evidence-base for each proposition was established using a systematic literature search and categorised according to strength (50). Briefly, the MOVE consensus recommendations, highlight that local strengthening and aerobic exercises; are a core management strategy for patients with lower limb OA regardless of associated radiographic findings, can reduce pain and progression of the condition, can improve function and health status, are generally safe and require adherence over the long term to be maximally effective (see Table 1-3) (50). In line with this, subsequent national and international best evidence recommendations for CKP (see Appendix 1) consistently suggest that local exercises (51), which include exercises such as strengthening, range-of-movement or stretching exercises focused on the knee and lower limb, should be undertaken in addition to general exercises, i.e. aerobic activity (2).

Table 1-3 The MOVE consensus recommendations with associated level of evidence

Proposition	Category of evidence (1-4)	Strength of recommendation (A-D)
Both strengthening and aerobic exercise can reduce pain and improve function and health status in patients with knee and hip OA	Knee 1B Hip 4	A C (extrapolated from knee OA)
There are few contraindications to the prescription of strengthening or aerobic exercise in patients with hip or knee OA	4	C (extrapolated from adverse event data)
Prescription of both general (aerobic fitness training) and local (strengthening) exercises is an essential, core aspect of management for every patient with hip or knee OA	4	D
Exercise therapy for OA of the hip or knee should be individualised and patient-centred taking into account factors such as age, comorbidity and overall mobility	4	D
To be effective, exercise programmes should include... **...advice and education to promote a positive lifestyle change with an increase in physical activity**	4 1B	D A
Group exercise and home exercise are equally effective... **...and patient preference should be considered**	1A 4	A D
Adherence is the principal predictor of long-term outcome from exercise in patients with knee or hip OA	4	D
Strategies to improve and maintain adherence should be adopted, e.g. long-term monitoring/review and inclusion of spouse/family in exercise	1B	A
The effectiveness of exercise is independent of the presence or severity of radiographic findings	4	Not recommended
Improvements in muscle strength and proprioception gained from exercise programmes may reduce the progression of knee and hip OA	4	D

Roddy E, Zhang W, Doherty M, Arden NK, Barlow J, Birrell F, et al. Evidence-based recommendations for the role of exercise in the management of osteoarthritis of the hip or knee - the MOVE consensus. Rheumatology 2005;44:67-73, by permission of Oxford University Press (50)

Categories of evidence: 1A = meta-analysis of RCT, 1B = at least one RCT, 4 = expert committee reports/opinions and/or clinical opinion of respected authorities. Strength of recommendation: A = directly based on category 1 evidence, D = directly based on category 4 evidence or extrapolated recommendation from category 1, 2 or 3 evidence.

The mechanism(s) through which exercise exerts positive effects on CKP are not completely understood. The most logical explanation is a mechanical one, in which increased muscle strength around the joint stabilises it and makes the muscles less prone to fatigue, reducing abnormal alignment and loading of the knee, improving gait and preventing further joint damage (3,29,52,53). Perception of instability in the knee joint is distressing for patients with CKP (54), thus it follows that local strengthening exercises could improve a patient's experience of living with the problem by reducing instability. While progression of CKP has been shown to be reduced by aerobic exercise in the absence of weight loss (55), objective measures

of quadriceps strength are not necessarily associated with radiographic severity or functional impairment (29,56). This suggests exercise exerts alternative or additional mechanisms of action. A recent literature review examined the proposed mechanisms of action of exercise for CKP (53). Additional mechanisms of action with at least some empirical research evidence to support them include; anti-inflammatory effects of exercise (29), the enhancement of synovial fluid delivery to cartilage and increases in joint fluid viscosity (53). Other suggested mechanisms of action, with as yet no clear research evidence, include effects on bone density and pain relief through stimulating connective tissue (53). It is likely that exercise leads to benefits in symptoms through a range of mechanisms, and these are likely to differ between individual patients. Although exercise is effective for managing CKP, a review of the literature did not suggest disease-modifying effects of exercise (57). Exercise efficacy appears independent of severity of OA changes seen on magnetic resonance imaging (MRI) unless severe patellofemoral changes are seen (in which case exercise is less likely to be effective) (58), further suggesting that there are few reasons for patients not to undertake exercise.

The systemic health benefits of exercise are well known, for example, improved cardiovascular status, emotional wellbeing, bone strength and proprioception and a reduction in falls, risk of dementia and mortality (57,59-62). Despite uncertainties about the exact mechanisms of action, empirical research evidence now unequivocally demonstrates that general aerobic, local strengthening and flexibility exercises improve pain and function in patients with CKP (8,43,50,63). Exercising to a moderate intensity also appears to be safe in most patients with CKP, regardless of pain severity (57,63,64). To identify the optimum exercise approaches (alone and combined) to use for patients with lower limb OA to improve pain and function, Uthman et al (8) undertook a comprehensive systematic review which,

after identifying relevant randomised controlled trials, used approaches to assess for the reliability and conclusiveness of the available evidence and to assess the relative effectiveness of different exercise interventions. Included trials had follow-up of 4-79 weeks (median 15 weeks) and most investigated exercise for knee OA (8). In people with lower limb OA, this review concluded that compared to no exercise use, strengthening, strengthening plus flexibility, strengthening plus flexibility plus aerobic, aquatic strengthening, and aquatic strengthening plus flexibility were found to be significantly likely to reduce pain (8), and strengthening plus flexibility plus aerobic exercise was significantly likely to improve physical function (8). Consistent with another review of exercise for knee OA, which found no significant differences in effect estimates between predominantly home based muscle strengthening and aerobic walking exercise (65), Uthman et al also observed little difference in effect between the different types of exercise. However, resulting from the Bayesian network meta-analysis approach used by Uthman et al (8) to compare within and between trial evidence on treatment effectiveness, the authors concluded that combining strengthening with flexibility and aerobic exercise (land or water based) appears to be the most effective strategy for reducing pain and improving function in people with lower limb OA (8). Others have suggested that, maximal gain may be achieved by focussing on different types of exercise on different days (66). While empirical evidence reveals there is generally little difference in outcomes between group and home exercises (50,63) and between different types of exercises (e.g. weight-bearing versus non-weight bearing, aquatic versus land-based, different types of strengthening exercise) (8,57,65), there is some evidence that non-weight-bearing strengthening exercises might be superior for pain relief when compared with weight-bearing strengthening exercises (67).

However, Tanaka et al also highlight the risks to cartilage integrity of prolonged unloading of a joint (67).

Attempts at quantifying the beneficial effects of exercise have been undertaken. Through undertaking home exercises, it is estimated that an extra 12% of patients might experience pain reduction over two years, in addition to the third of patients whose pain would have reduced naturally over this time (7). A Cochrane review investigating the effects of land-based exercise (of any type duration and frequency) for people with knee OA (63) quantified the improvements brought about by exercise in terms of a 0-100 scale. This review identified that moderate-to-high quality evidence showed that pain, function and quality of life improved among patients within two to six months of completing an exercise programme, compared to those who did not, by 12,10 and 4 points, respectively (63). Finally, the beneficial effects of exercise interventions have also been reported in terms of effect sizes (ES) which, at least in the short-term, appear to be favourable when compared to other commonly used management approaches (see Table 1-4), however the time scales to which the ES refer have not always been made clear. Exercise interventions may take a variety of forms including brief advice to exercise alongside other advice within a short primary care consultation, provision of written information, referral to group exercise programmes through to a course of one-to-one, individualised exercise. The generalisability of the ES illustrated in Table 1-4 may be limited as most of the interventions from which the data is drawn utilised supervised exercise programmes rather than advice to exercise or home exercises alone (63,68). Indeed, a subgroup analysis undertaken within a systematic review investigating randomised and non-randomised studies examining physical therapy interventions with CKP and intermediate and patient-centred outcomes, demonstrated that

involvement of a physical therapist was associated with larger ES for all outcomes from aerobic or strengthening exercises, than those without (69).

Table 1-4 Effect sizes (ES) of management approaches for CKP for pain and function

	ES pain (95% CI)	ES function (95% CI)
Exercise		
Aerobic exercise	0.52 (0.34, 0.70)	0.46 (0.25, 0.67)
Strengthening exercise	0.32 (0.23, 0.42)	0.32 (0.23, 0.41)
	0.38 (0.23, 0.54)	0.41 (0.17, 0.66)
Water based exercise*	0.19 (0.04, 0.35)	0.26 (0.11, 0.42)
Pharmacological management strategies		
Paracetamol*	0.14 (0.05, 0.23)	0.09 (-0.03, 0.22)
	0.18 (0.11, 0.25)	
Topical NSAID	0.44 (0.27, 0.62)	0.36 (0.24, 0.48)
Oral NSAID*	0.29 (0.22, 0.35)	-----
	0.37 (0.26, 0.49)	
Oral opioids	0.22 (0.03, 0.42) to	
	0.36 (0.26, 0.47)	
Intra-articular corticosteroid	0.58 (0.34, 0.75)	0.20 (-0.14, 0.53)
Non-pharmacological, non-exercise management strategies		
Weight loss**	0.20 (0.00, 0.39)	0.23 (0.04,0.42)***
Self-management and education	0.06 (0.02, 0.10) to	0.06 (0.02, 0.10)
	0.29 (0.17, 0.41)	

*Data are for hip and knee OA combined; **417 patients, following significant weight loss of 6.1kg (pooled from studies 8 weeks to 18 months duration)(70); ***Reported as "self-reported disability". CI = confidence interval; ES = effect size (0.2 = small, 0.5 = moderate, >0.8 = large); NSAID = non-steroidal anti-inflammatory drug. ES derived from studies of different durations, time period to which ES applies is unclear. Taken from Roddy et al (2005) (65), Zhang et al (2010) (71), McAlindon et al (2014) (72) and Christensen et al (2010) (70)

While exercise is associated with pain decrease over time (e.g. two to six months (63)), studies do report pain increases associated with individual episodes of exercise in 0-22% patients (50,64,69). This is in contrast to studies examining the onset of pain relief with analgesics which provide evidence that analgesic action is better than placebo among those with knee OA flares within three to four hours (COX-II inhibitors) (73) and on walking within two (tramadol and paracetamol) to six (naproxen) hours (small sample n=22) (74). Further, a significant placebo effect of oral analgesia is seen within the first four hours of taking it (73). Similarly, the ES for pain relief following a single intra-articular corticosteroid injection is moderate after one week (0.72 (95% CI 0.42, 1.01)), although it reduces after four weeks (0.28 (-0.17, 0.73)) (71). This may potentially affect the acceptability of exercise as a pain

relieving strategy to patients, who often present because they are having a flare of their symptoms (12,75).

A factor that limits the effectiveness of any exercise intervention is patient engagement with, and adherence to, exercise. This is known to be an issue in the context of exercise for CKP, particularly over time (57,76-81) and is known to, at least in part, explain the effectiveness of exercise interventions (78). Previous work indicates that while the majority (90%) of patients may adhere to exercise interventions over two months, the proportion adhering declines to 19-48% over two years (78). Therefore, in line with wider self-management strategies, it is recommended that attempts to integrate exercise into the management plan of a patient with CKP should be specific and individualised (44,78). Tailoring of exercise should take account of patients' lifestyles, interests, values, abilities (82), preferences, age, comorbidities (50,80) and availability of services or resources (e.g. equipment) (47,57). Patients' ability to adhere to exercise over time should be monitored (63). To minimise burden and improve the acceptability of exercise within a management plan, exercise should be integrated into usual activities of daily living (47) and focus on wellbeing and independence (82).

1.3 Patients' use of exercise for CKP

Patients with CKP can view exercise positively, for example, some perceive 'keeping active' as their primary coping strategy (54) and recognise that exercise stops or slows their functional deterioration (83,84). Some patients with CKP demonstrate self-motivation and undertake exercise without receiving a formal recommendation to do so from a HCP (85-87). However, evidence suggests that general exercise recommendations are currently not met among adults without joint pain (only 55% are 'regularly' active) (88). Among patients with joint pain, the

proportion meeting exercise recommendations is even lower (79,88-93) and particularly so among females, those with increasing body mass index (BMI) (91) and African-Americans (94). For example, 40% of older adults reporting CKP in the last 12 months also reported using exercise in the past month as treatment (87) and of patients with radiographically diagnosed knee OA whose activity was objectively measured with accelerometry, only 8% of women and 13% of men met aerobic exercise guidelines (91). Even when patients do exercise some remain concerned about whether this makes the problem better or worse (95) and exercise adherence significantly declines over time (78).

Potential barriers to the use of exercise among patients are numerous and include; the features of CKP itself (e.g. pain, stiffness, functional limitation, resulting poor sleep), exercise not fitting with patients' preferences (e.g. a desire for quick relief of symptoms), belief among patients that exercise will not help (e.g. from previous negative experiences, perceptions of futility, fear about making the pain worse or damaging the joint), uncertainty about what to do, the existence of other comorbidities, contextual issues (e.g. difficulties accessing or feeling intimidated by formal exercise venues), competing demands (e.g. occupational or domestic duties, dependents, hobbies), feeling unsupported (e.g. either from HCPs or social contacts) and poor body image (19,79,84,87,89,96-108). Barriers will differ for each patient and many are potentially modifiable through careful identification and counselling by HCPs.

While interactions with HCPs can be positive and motivational with regards to undertaking exercise, HCPs' interactions with patients may also introduce barriers to exercise. This may occur either explicitly, through advice to rest (i.e. not to exercise) (98), or, perhaps, inadvertently, for example, through using the term 'wear and tear' (109), which may suggest to patients that the problem has been caused

by use and thus exercise may cause further damage, or through suggesting patients need to be careful about movement or exercise. Potentially relevant factors relating to HCP-patient interactions have been conceptualised by models relating to compliance (or adherence), for example Ley's model of compliance (which suggests that patient memory, understanding and satisfaction all influence their compliance)(110) and, more recently, the necessity-concern framework (NCF, which suggests that adherence is dependent on an optimal balance between a patient's beliefs about the need for treatment and their concern about the treatment)(111). These models indicate that to adhere to specific management approaches, patients need to be adequately informed about the benefits and risks of the suggested management, they need to agree that the management is an optimum approach for them and they need to remember to undertake the specific actions involved. These models suggest that the nature of the information that HCPs provide to patients, may significantly impact patients' subsequent behaviour. Because the information that HCPs relay to patients is dependent upon their own beliefs, for example, about the nature and treatability of the condition (110), the potential link between HCPs attitudes, beliefs and behaviours and those of their patients' starts to emerge. To identify the influence of patients and GPs' beliefs and expectations on the process of care for chronic musculoskeletal pain, Parsons et al (112) undertook a review of qualitative studies. This review identified that GPs' beliefs influenced the management strategies and education they offered, but also that patients' attitudes and beliefs appeared to influence GPs' behaviour (112). More recently, Darlow et al (113) undertook a systematic review of twenty studies that investigated the association between HCPs attitudes and beliefs and the attitudes, beliefs, clinical management and outcomes of patients with low back pain (LBP). This review identified strong evidence that HCPs' beliefs about LBP are associated

with those of their patients, moderate evidence that HCPs' attitudes and beliefs are associated with the content of the education given to patients, the likelihood of prescribing bedrest or providing sickness certification and with adherence to guidelines (113). Given that Darlow et al conclude that the attitude and beliefs of patients are strongly associated with the attitudes and beliefs of the HCP with whom they have consulted (113), and that GPs are the primary point of contact for patients with CKP who seek formal medical advice and treatment in the UK healthcare system (100,114-116), the following sections consider the role of GPs in managing patients with CKP and GPs' use of exercise for CKP.

1.4 The role of GPs in the management of CKP

Annually 33% of UK older adults present to their GP with a musculoskeletal problem and the knee is the second most common region of complaint (117). Knee problems account for 416-686 patients consulting per 10,000 persons registered with a GP practice and aged 45 years or older per year (117,118). Of those referred for knee joint replacement surgery, 39% have not consulted any other professionals aside from their GP (119). GPs are therefore well-placed to address individual patients' understanding of the benefits and safety of exercise for CKP and to promote the inclusion of exercise in patients' management plans. Given the prevalence of CKP in older adults, at a population level, GPs have the potential to make significant changes through small improvements in functioning across the large number of patients with CKP that they see (120). The next section summarises what is currently known about GPs' use of exercise for CKP.

1.5 Use of exercise for CKP among GPs

As a primary point of healthcare advice for patients with CKP, GPs are well placed to influence patients' attitudes, beliefs and behaviours regarding exercise. However,

investigations undertaken among patients with CKP show that only 37-46% (87,121,122) of patients report having received advice to exercise and GPs' reported use of this core treatment appears to be suboptimal (only 66-76% GPs reported using exercise to manage CKP (123)).

GPs do not have the capacity to synthesise and critically appraise available published research evidence pertinent to each of their management decisions. Therefore, it is appropriate to compare GP's clinical behaviours with recommendations for practice contained in relevant best-practice guidelines (124). Guidelines are 'systematically developed statements to assist practitioner and patient decisions about appropriate healthcare for specific clinical circumstances' (125) and are particularly useful in the context of exercise for CKP (8) as the evidence-base is robust (126). By presenting a best evidence summary in a clinically applicable way, guidelines should assist HCPs to provide high quality, evidenced-based care (127). They may also improve efficiency of care through avoidance of unnecessary, or potentially harmful, management strategies (128,129). Interestingly, advice to, or use of, exercise among GPs in the UK, does not appear to have improved since the publication of the first NICE OA guidelines (48) in 2008. By way of specific examples, Porcheret et al identified that 46% of patients reported having received advice to exercise in 2007 (122) compared with Holden et al reporting this proportion to be 37% in 2012 (87). Therefore, to understand the possible causes of this apparent evidence-practice gap, one needs to consider the wider factors that influence GPs' clinical behaviours. To make sense of behaviours, to identify key factors influencing the behaviour of GPs with respect to exercise for CKP, and to organise these elements into a logical framework that can be used to explore and explain behaviours, theories of behaviour can be helpful. A summary of the theories of behaviour considered appropriate for this PhD and the subsequent

development of an underpinning model used to investigate the attitudes, beliefs and behaviours of GPs are outlined in Chapter 2.

1.6 Chapter summary

CKP is a common problem among older adults and GPs have a key role in the early advice and management of these patients. Current guidance promotes the use of both general and local exercise to improve pain, function, quality of life and mobility of patients with CKP. To maximise patient outcomes, GPs should be encouraging the incorporation of both general and local strengthening exercise in the management plan of all patients with CKP. It is known that attitudes, beliefs and behaviours of GPs may impact those of their patients and there appears to be some evidence that exercise may be underused by GPs in the context of the clinical management of patients with CKP. Therefore robust investigation of the attitudes, beliefs and behaviours of GPs was necessary to better estimate and understand the use of exercise and to inform future research to improve the management of patients with CKP.

1.7 Aims and objectives of this PhD

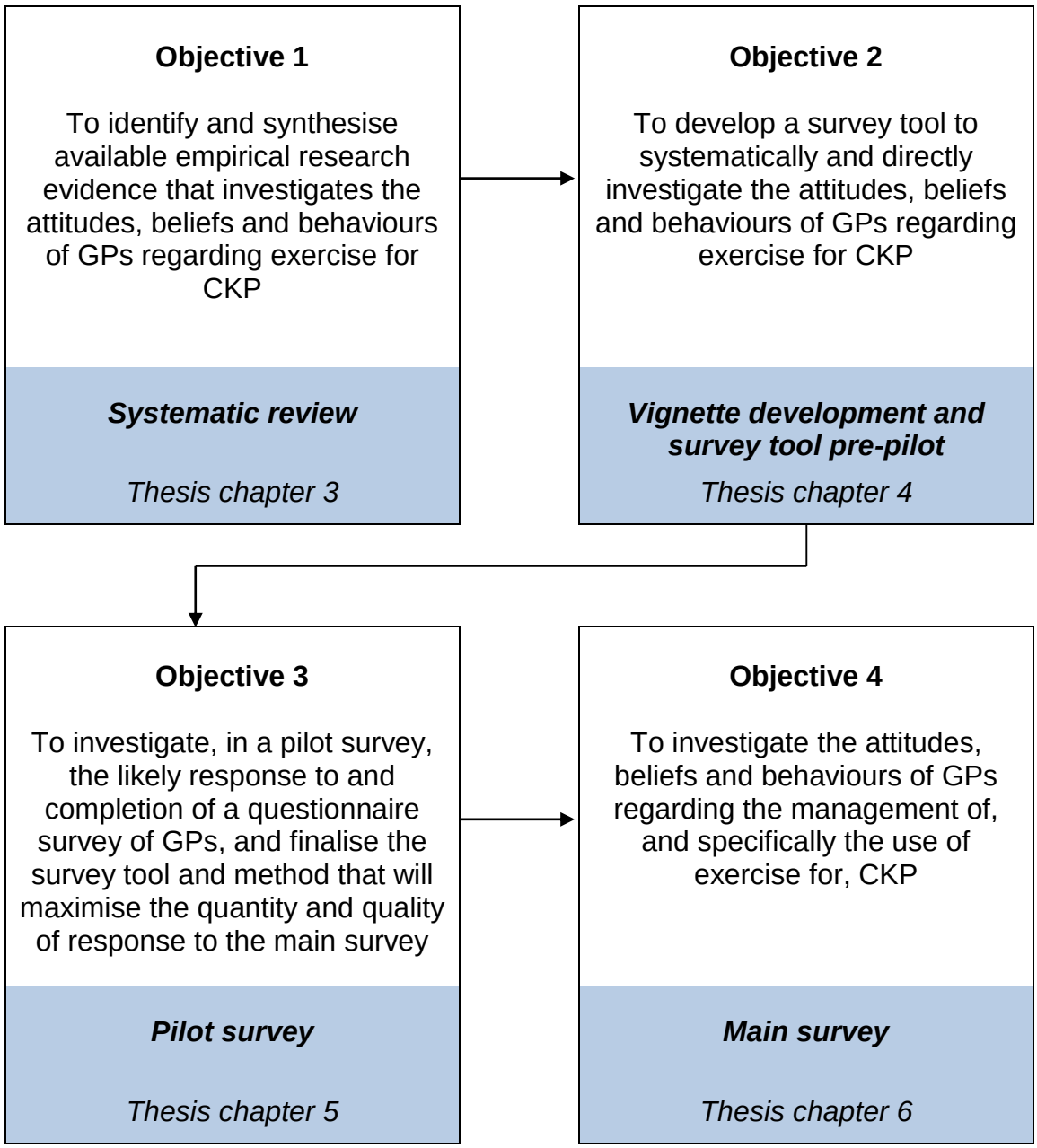
The overall aim of this PhD was to investigate GPs' attitudes, beliefs and behaviours regarding exercise for patients with CKP. This was undertaken by addressing four objectives, which were to:

1. Identify and synthesise available empirical research evidence that investigates the attitudes, beliefs and behaviours of GPs regarding exercise for CKP
2. Develop a survey tool that will systematically and directly investigate the attitudes, beliefs and behaviours of GPs regarding exercise for CKP

3. Investigate, in a pilot survey, the likely response to and completion of a questionnaire survey of GPs, and finalise the survey tool and methods that will maximise the quantity and quality of response to the main survey (objective 4)
4. Investigate the attitudes, beliefs and behaviours of GPs regarding the management of, and specifically the use of exercise for, CKP

The structure of the PhD and associated methods are illustrated in Figure 1-1. Prior to describing how each objective was achieved in Chapters 3-6, the next chapter outlines the development of the underpinning theoretical model linking attitudes, beliefs and behaviours of GPs, which was used to help inform the subsequent data collection and analysis within this PhD.

Figure 1-1 PhD objectives and methods



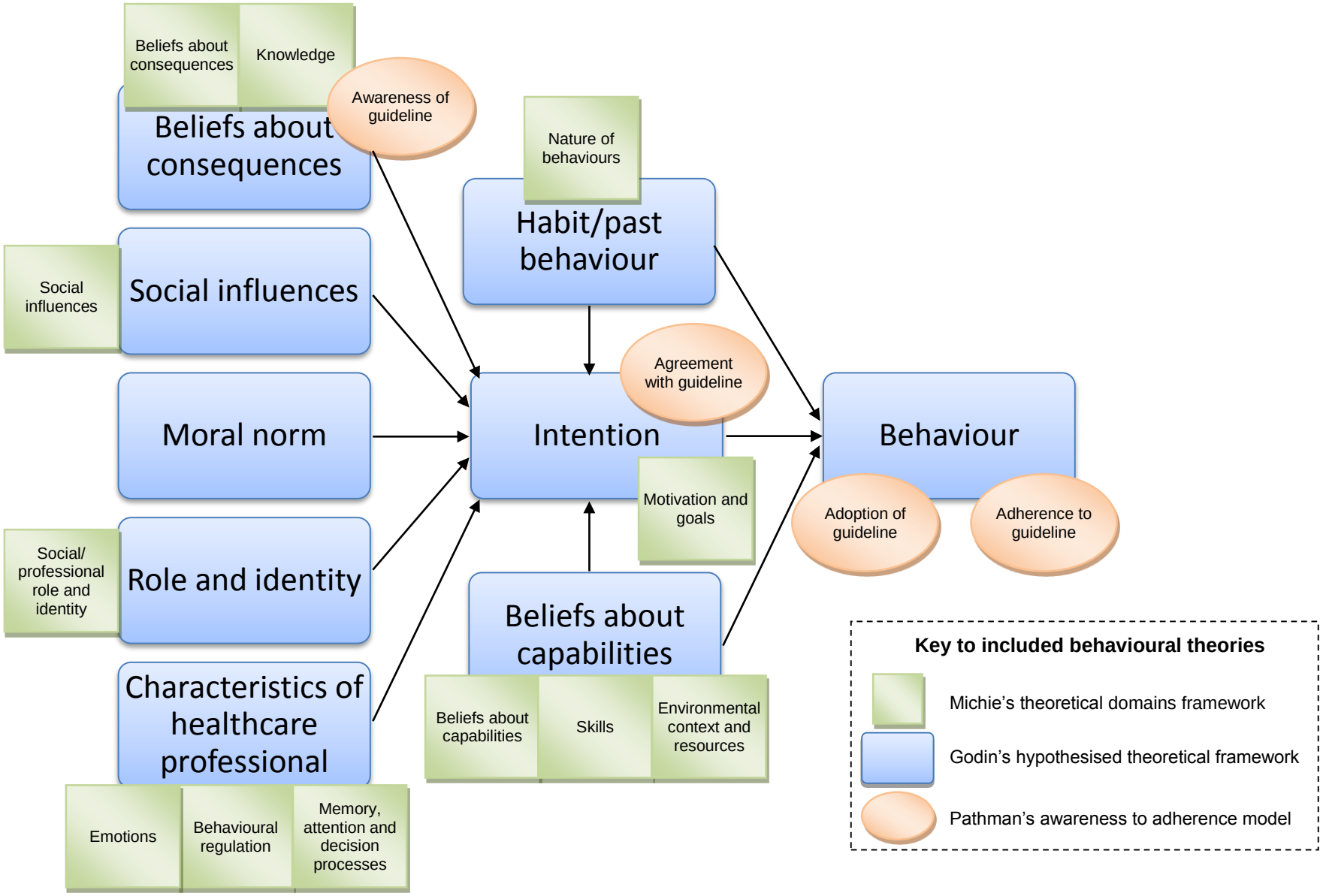
2 Association between GPs' attitudes, beliefs and behaviours: development of an underpinning model

For the purpose of this thesis, 'behaviour' is defined as 'the way in which one acts or conducts oneself' (130). Clinical behaviours are therefore behaviours performed in the clinical context (131). The behaviour of interest in this PhD is GPs' clinical management of patients with CKP, specifically their use of exercise and the extent to which this aligns with best available evidence and, in particular, NICE guidelines (48). Attitudes are defined as a settled way of thinking (130). A belief is an acceptance that something exists or is true or a firmly held opinion or conviction (130). Attitudes and beliefs may be reported or implied and can influence the behaviours of individuals; for example if a GP is aware of best practice recommendations but believes exercise for CKP is ineffective, they may not include exercise in the management of patients. However, the association between attitudes, beliefs and behaviours is more complicated than this as many variables may influence behaviours, and factors that impede behaviours are not necessarily the reverse of those that facilitate them. No single theoretical model robustly predicts behavioural intentions ('the expressed motivation to perform some behaviour or achieve some goal' (132)) or actual clinical behaviours among GPs. Neither has any existing work been identified that applies behavioural theories specifically to the investigation of GPs' use of exercise for patients with CKP. Therefore, to address these limitations, demonstrate why concurrent investigation of attitudes and beliefs is necessary, comprehensively consider influences on GPs' clinical behaviour and consider the role of best practice recommendations, an underpinning model for this PhD was developed to describe the possible associations between GPs' attitudes and beliefs and behaviours.

2.1 Approach used to develop the underpinning model

The underpinning model was constructed by drawing on three previously developed theoretical models explaining the associations between attitudes, beliefs and behaviours. These were Michie's theoretical domains framework (TDF) (133), Godin's hypothesised theoretical framework (131) and Pathman's awareness-to-adherence model (134). Combining the three models allowed for consideration of personal factors that influence GPs' behaviour, the contextual factors, such as the systems they work within and the people they work with, that may influence their behaviours and the nature of the relationships between these factors. The model was refined following the systematic review (described in Chapter 3) such that it best represented existing empirical evidence about the potential links between attitudes, beliefs and behaviours. It is accepted that the placement of certain elements within the underpinning model could be contentious, as some may fit in multiple positions; however, for the sake of simplicity single positions are given to each element. The resulting underpinning model is illustrated in Figure 2-1. The following sections provide justification for the selection of these three theoretical models as being particularly relevant to this thesis. Given that all these models are largely derived from the theory of planned behaviour (TPB) (135), an evaluation of the TPB in this context is first presented.

Figure 2-1 Underpinning model used to describe the possible associations between GPs' attitudes and beliefs and behaviours



2.2 Theory of Planned Behaviour

The TPB is an established behavioural theory and provides a framework within which the influences on behaviours can be identified and behaviours can be explained (135). Ajzen outlines that attitudes develop from beliefs. Beliefs link behaviours to a certain outcome or quality, which in turn may be viewed positively or negatively, as a result attitudes towards a particular behaviour are formed (135). Claiming that the intention to perform a specified behaviour is the key predictor of that subsequent behaviour, the TPB hypothesises that one's attitudes, subjective norms and perceived behavioural control impact on one's behavioural intentions and/or subsequent behaviour (135). The inclusion of perceived behavioural control in the TPB recognises that some behaviours are not under the complete control of the person performing them (135). This is particularly relevant for this PhD as factors such as patient preferences and healthcare system resources and constraints may influence GPs' clinical behaviour for patients with CKP.

Reviews of the TPB among different populations and in different contexts confirm its ability to predict behavioural intention and behaviour (131,136,137). The TPB may explain up to 20% of the variance in measures of actual behaviour (136) and it has been suggested to be particularly helpful for predicting self-reported behaviour among general populations (136) and GPs (138). By way of example, a study using the TPB to understand GPs' antibiotic prescribing found that the TPB explained 3% of the variance in behaviour (actual antibiotic prescriptions), 31% of the variance in behaviour simulation (reported behaviour in response to case vignettes) and 20% of the variance in behavioural intention (138). A summary of the findings from studies examining the use of the TPB among GPs can be found in Appendix 2. Overall, the perceived behavioural control construct appears to be a strong predictor

of both behavioural intention and behaviour across many studies of GPs (138-150). However, none of the studies specifically investigated initiating exercise into a patient's management plan, and only two addressed the management of musculoskeletal pain, both in the context of the use of radiographs for LBP (146,148). Although the use of the TPB to predict behaviours among GPs does appear to be appropriate (138,148) there are limitations. The TPB's predictive abilities appear to be reduced among GPs compared with other physicians (147). For example, one study demonstrated that while the TPB performed well, explaining 48% of the variance in physicians' behavioural intentions to follow best practice guideline recommendations overall, when primary and secondary care physicians were differentiated, the strength of prediction of behavioural intentions among primary care physicians was reduced (147). The predictive capabilities of the TPB have been most widely studied in relation to behavioural intentions rather than for behaviours. However, of those studies that examined both intentions and behaviours, the TPB often explained more variance in intended (self-reported) behaviour than in actual observed behaviour (146,148-150). Finally, a significant association between behavioural intention and actual behaviours is not always observed, for example, a study examining GPs' prescribing intentions found no significant association between these intentions and their actual prescribing behaviour (149). Therefore it appears that the TPB alone is insufficient in terms of fully explaining the behaviours of GPs.

2.3 Michie's theoretical domains framework

Although an association between behavioural intention and actual behaviour has been observed (136), the strength of this relationship among HCPs is variable (149,151). Given the variability in the observed associations between factors within

the TPB and physician behaviour, additional influences on behaviour have been explored in research. The TDF was developed from a six-stage consensus exercise to establish key theoretical domains for use when undertaking behaviour change interventions (133). Development of the TDF included identifying all relevant theories (n=33) and theoretical constructs (n=128), then simplifying these into ten initial theoretical domains by prioritising 14 constructs that were particularly relevant to changing the behaviour of HCPs. After evaluating the importance of the theoretical domains and optimising these based on original theories and constructs, 12 domains were developed. An interdisciplinary evaluation was undertaken to refine the domains, before validating the domain list using the original theories and constructs and developing pilot interview questions to elicit information from HCPS and service managers relating to each domain. Using health psychology theorists (n=18), health services researchers (n=16, including three GPs) and health psychologists (n=30), this resulted in 12 theoretical domains to be considered. These domains, illustrated by the green squares on the underpinning model for this PhD (Figure 2-1), encompass factors relating to the individual GP (i.e. their knowledge, skills, emotions) as well as wider organisational issues (i.e. environmental context and resources) and social issues (i.e. social influences). Although the TDF for predicting behaviour change is the most comprehensive of the three models used to develop the underpinning model, using this alone neglects the interplay between the domains contained within it and the direction of the associations between domains (152). It was therefore felt necessary to incorporate aspects from other key theoretical models.

2.4 Godin's hypothesised theoretical framework

A review, based on the domains of the TDF, was undertaken by Godin and colleagues to examine the use of social cognitive theories in research with HCPs (131). This review endorsed the superiority of the TPB (and the associated forerunning theory of planned action (TPA)) and found it explained 35% of the variance of HCPs' behaviours. However, limitations of the TPB in predicting HCPs' behavioural intentions were identified and the theory of interpersonal behaviour (TIB) appeared to be a stronger predictor of behavioural intentions, explaining 81% of the variance, compared with the TPB (including TPA) which explained 59% (131). Godin et al (131) therefore presented a hypothesised theoretical framework, developed by amalgamating the TPB and the TIB, for use in predicting and explaining HCPs' behaviours. This framework hypothesised that beliefs about consequences, social influences, moral norm, role and identity and characteristics of HCPs influence behavioural intention; and beliefs about capabilities and habit/past behaviour influence both intention and actual behaviour (131). Godin's hypothesised theoretical framework includes the components that best predict behavioural intention and behaviour among HCPs, Godin's framework appears to be more relevant to GPs than simply using the TPB alone. In particular, the inclusion of beliefs about role, may be particularly relevant to GPs as their specific roles in managing conditions is often little defined. However, Godin's framework has not been prospectively tested and contains factors that have been shown not to consistently predict behaviour and behavioural intention among HCP groups. Godin et al noted that the variance in behaviour explained by sociocognitive models including the TBP, TIB and TPA was 28% among physicians, 24% among nurses and 55% among other professionals, although when compliance with guidelines was specifically looked at these figures were 0.1% for physicians and 19% for nurses

(131). Similarly, the variance in behavioural intention explained was lower among physicians (51%) than nurses (66%) and other HCPs (59%), again with more variance in the intention to comply with guidelines being explained among nurses (62%) than physicians (50%) (131). While Godin's framework alone is likely to be insufficient to fully explain the behaviours of GPs the domains within the TDF were retained and mapped onto Godin's hypothesised theoretical framework (represented by the blue rectangles) on the underpinning model for this thesis (Figure 2-1). The final model used to create the underpinning model was a simple behaviour change model, the awareness-to-adherence model (134), is now described.

2.5 Pathman's awareness-to-adherence model

The awareness-to-adherence model (134) links the common-sense processes that are essential in translating best practice guidelines into regular clinical behaviour; its components are represented by the orange ovals in Figure 2-1. It was included to capture the processes involved in translating best practice guidelines into clinical behaviour. It proposes that first clinicians must be *aware* of relevant guidelines or best practice recommendations. Next, they must intellectually *agree* with them before incorporating them into clinical practice (*adoption*), before subsequently using the recommendations on a regular basis (*adherence*). Whilst progression through every stage of the model is not obligatory and stages of the model may be skipped (153), this model was included as it provides additional focus on potential explanations of behavioural intention and behaviour which are not explicitly covered by the TDF. For example, awareness of guidelines or best practice recommendations that all patients should undertake exercise, may be the first step in a GPs believing that exercises are effective for CKP (beliefs about

consequences); although it is recognised that awareness of guidelines is not a prerequisite for GPs to have positive beliefs about the effectiveness of exercise. Further, GPs may have no intention to initiate exercise in the management plan of a patient with CKP if they do not agree with the guideline recommendations.

In summary, the underpinning model for this PhD has been drawn from three theoretical models. While each, alone, has value in predicting and explaining behaviours, none has been demonstrated to robustly predict the behaviours of GPs. The underpinning model therefore was created to ensure broad consideration of the factors that may be associated with GPs' clinical behaviours to help inform the data collection and analysis within this PhD. The following sections now consider, in more detail, the elements of the underpinning model and how each may influence, or be associated with, GPs' clinical behaviour with respect to exercise for patients with CKP.

2.6 Influences on GP behaviour: elements of the underpinning model

2.6.1 Attitudes about the behaviour and beliefs about the consequences

In the context of this PhD, GPs' attitudes and beliefs of interest relate to whether exercise is an appropriate and/or acceptable management strategy for patients with CKP. To set this in context it is important to first consider GPs' beliefs about CKP in general and whether they believe it is eligible for, or amenable to, any medical intervention, before trying to understand GPs' attitudes and beliefs specifically about using exercise for CKP.

2.6.1.1 Attitudes about CKP in general

GPs' attitudes about CKP may be important in two respects when considering the use of exercise for CKP. The first is the GPs' beliefs about the candidacy of CKP.

This is defined as '*the ways in which people's eligibility for medical attention and intervention is jointly negotiated between individuals and health services*' (154). Although patients' perceptions of candidacy may impact whether they present to the GP or not, the GPs' beliefs about the candidacy of CKP is of importance as this potentially impacts their overall management of this condition, not just the use of exercise. For example, McDonald et al report OA being underdiagnosed among those presenting with joint pain and overshadowed by other comorbidities such as hypertension (155), which may reflect negative beliefs about candidacy of CKP in general or relative to other problems. Related to this is the perception that managing CKP is futile due to a lack of effective treatment (156). Such beliefs may be detected by asking about the GPs' role in managing CKP as a whole, which is considered elsewhere in the underpinning model, but they may also be identified more implicitly by considering the descriptions of the condition given by GPs to patients. For example, GPs may normalise the problem, for example through the use of the term '*wear and tear*', suggesting the condition is a natural consequence of aging (83,100,157,158) and thus implying that little can be done (159) or the situation cannot be reversed or improved (87,96,99,158) and thus medical intervention is not necessary.

GPs' attitudes about CKP that may also impact their use of exercise are their attitudes regarding the nature of CKP, how they interpret the pain, their attitudes and beliefs about the nature of the pain in CKP, and how pain can or should affect functioning among affected patients. The basic evolutionary role of pain is to raise the alarm of potential risk of, or actual, harm to the body. Reflexive mechanisms work even in subconscious states to protect the body from damage (160). In the context of chronic pain conditions (pain lasting >12 weeks), pain has persisted beyond the normal time for healing and has thus lost its status as a helpful warning

sign (161). Much empirical work investigating attitudes, beliefs and behaviours of HCPs regarding pain has focused on chronic LBP. In this context an association between HCPs beliefs about pain being a sign of tissue damage and their clinical behaviours has been demonstrated (162). By way of example, a review of HCPs' beliefs about LBP demonstrated that these can influence their provision of education and advice to patients about physical activity, their adherence to best practice guideline recommendations and their patients' attitudes and beliefs about pain (113). One study observed that fear-avoidant beliefs among GPs, which indicate that GPs are concerned that pain is indicating damage and thus exercise and activity can cause harm, are associated with a reduced use of exercise in the management of patients with chronic LBP (163). GPs' understanding of the nature of CKP, and the meaning of pain in this patient population (also described as their treatment orientation (164), see Section 4.2.3) has not been explicitly researched in previous studies. However, the implications of a GP's negative attitude towards exercise could be even wider reaching as it is recognised that a GP's negative attitude might strengthen a patient's negative attitude (113), thus potentially making the patient less receptive to advice to exercise from other sources. If exercise use is impacted, GPs instilling or reinforcing negative attitudes in patients about the meaning of pain in the context of CKP may have a negative impact on the management of the patients' pain and function, with respect to their CKP, and, potentially, the management and control of comorbid conditions such as cardiovascular, metabolic or respiratory diseases.

2.6.1.2 Attitudes and beliefs of GPs about exercise for CKP

GPs' attitudes and beliefs about exercise for CKP may be elicited through their awareness of current evidence-based recommendations, outlined in clinical guidelines, and their agreement with the use of exercise for CKP. Awareness of

guidelines is now discussed and agreement with guidelines is considered alongside behavioural intention in Section 2.6.7.1.

Awareness of guidelines

The underpinning model hypothesises that awareness of best available evidence and clinical guidelines regarding exercise for CKP may be associated with a positive belief about the consequences of exercise in this context and thus the subsequent use of this management approach. While 79% of French GPs 'knew of the EULAR 2000 recommendations' for CKP (165), this is not synonymous with awareness of the recommendations within them. GPs need sufficient time to read and familiarise themselves with the content of guidelines (153,166) and evidence suggests that GPs do not always manage to do this (167,168). A recent cross-sectional survey of UK GPs revealed that 8% of GPs reported using no guidelines to inform their management of OA in primary care (167) and another UK GP survey found that only 58% reported having read the NICE OA guidelines (168). In practice, GPs may resort to the use of professional experience, local area guidelines, their own general practice surgery guidelines or protocols, primary care digests or 'magazines', discussion and networks to educate themselves rather than referring back to the guidelines or source evidence directly (156,167,169). Thus, an individual GP's awareness will only be as good as their informants'. The impact of GPs' awareness of guideline recommendations on the use of exercise for patients with CKP is unknown.

2.6.2 Subjective norms: moral norms and social influences

The underpinning model indicates that GPs' clinical behaviour might be influenced by the environment in which they practise, and this includes key social influences. The concept 'subjective norm' relates to two elements of the underpinning model:

moral norm and social influences. Moral norm is the individuals' beliefs (or rules) about their personal responsibility to perform the behaviour (131,145), therefore there is some overlap with attitudes about role and identity (which are described in Section 2.6.3). Social influences relate to an individual's beliefs about what important others think they should do (137,145) and the individual's degree of motivation to behave in a way that is seen to be similar to others (137). Previous work has identified social norms to be particularly predictive for GPs' behavioural intention and/or behaviours in a variety of contexts, for example; undertaking or referring for clinical examination of a patient with human immunodeficiency virus (HIV) (139)), referring for lumbar spine x-ray in patients with LBP (148,170) and educating adolescents about sexually transmitted infection and HIV (140). No studies have been identified that have specifically examined GPs' social influences in the context of managing CKP. In this context, 'important others' may include the affected patient, the GP's immediate practice team, wider primary care colleagues (e.g. physiotherapists) and secondary care colleagues (e.g. rheumatologists, orthopaedic surgeons). Influence may be exerted directly from each of these groups, through clinical conversations, correspondence or through educational sessions. However, patients may also report back to GPs their experiences of other professionals and the treatments they offer. Potential social influences are now described.

2.6.2.1 Social influences: general practice team

UK GPs are required to maintain contemporary clinical knowledge (171). As previously discussed, GPs do not always consult guidelines, or original sources evidence, but may instead seek advice from colleagues (169). Indeed, where GPs have undertaken further professional development or education, they are encouraged to share this learning with their colleagues (171). The general practice

clinical team may include nurses, other GPs and trainees, all of whom will have their own individual attitudes, beliefs and experiences. GPs' colleagues within the immediate practice team, in addition to key opinion leaders, drug company representatives and ad hoc experiences (169) can all influence GPs' clinical behaviours and internal '*guidelines*' (which Gabbay et al (169) name '*mindlines*'). Thus, GPs' knowledge may only be as complete, accurate and unbiased as that of their informants'. This presents a potential problem as general practice targeted digests, magazines and journals often summarise research findings and guidelines but the emphasis of such summaries may not always provide an accurate reflection of the underlying evidence (see Table 2-1). Further, unless the practice team are all working to the same approach, mixed messages from different team members may undermine a GP's, or a patient's, confidence in using a particular management approach. For example, in this context, one GP may advocate exercise as a core approach for a patient with CKP, however another is concerned that this may cause further harm and prescribes medication to address the pain and advises the patient to rest. This may elicit doubt within the patient about the previous advice to exercise, particularly if the medication seems to work, thus the patient may not engage in, or sustain, exercise behaviour. This may also reduce the chance of the first GP using exercise again, either because they become uncertain about whether this is what they should be doing or because they may see it as futile if the advice is going to be undermined at a future date.

Table 2-1 Example of change of emphasis of the NICE OA guideline by a summary published in a GP targeted publication

Actual text from NICE guideline	Text from GP publication
"Healthcare professionals should consider offering paracetamol for pain relief in addition to core treatments "	"Paracetamol remains a first line option in OA..."
"Offer advice on the following core treatments to all people with clinical osteoarthritis. Access to appropriate information Activity and exercise Interventions to achieve weight loss if the person is overweight or obese" "Healthcare professionals should consider the use of TENS as an adjunct to core treatments for pain relief "	"Non-pharmacological options include muscle strengthening, aerobic exercise, weight loss and TENS as an adjunct to pain relief...."

TENS = transcutaneous electrical nerve stimulation. Taken from NICE OA guideline (44) and GP publication, Pulse (172).

2.6.2.2 Social influences: physiotherapists

It is likely that GPs view physiotherapists as exercise specialists. Therefore, GPs may model exercise use on that provided by physiotherapists for patients with CKP. There is evidence that some GPs value feedback from physiotherapists about the patients they have referred and that when lines of communication between physiotherapists and GPs are good, physiotherapists can influence the types of patient referrals that GPs make (173). However, uncertainty about the role and safety of exercise and deviation from evidence-based recommendations for CKP have been reported by physiotherapists (174). The Attitudes and Beliefs Concerning Knee pain (ABC-Knee) study used a postal, cross-sectional, vignette-based survey of 2000 UK chartered physiotherapists to examine the reported use of exercise for CKP. Whilst 99% of respondents reported using lower limb (local) exercise for CKP, with strengthening and range-of-movement exercises being the most commonly used, there was limited use of general exercise and balance training (174). Further, responses to attitude statements in the same questionnaire revealed a lack of consensus about the perceived safety, and value, of general exercise

recommendations for CKP. Physiotherapists predominantly viewed exercise as a method of strengthening and stabilising the knee joint, rather than an intervention that is effective at reducing knee pain (175). Overall, physiotherapists viewed exercise as more beneficial for CKP patients who have lower levels of pain and less knee joint damage on imaging (175). The findings from the ABC-Knee study suggest a risk that social norms arising from physiotherapists may have a negative effect on GPs' use of exercise among some patients with CKP, for example, those with higher levels of pain. However, it is acknowledged that GPs' experience of physiotherapists' management of patients with CKP is likely to be variable.

2.6.2.3 Social influences: rheumatologists

As medical specialists in arthritides, including CKP, the management of CKP by rheumatologists may influence GPs' attitudes, beliefs and/or behaviours. GPs may use the clinical plans created by rheumatologists to guide their management of the patient they have referred and, possibly construe such plans for other similar patients. However, rheumatologists' use of exercise for patients with CKP has been shown to be variable (176-181). Studies have demonstrated that between 43% (181) to 100% (180) of rheumatologists report to use exercise or refer to physiotherapy. Thus if GPs use rheumatologists' plans to guide their management of patients, this may help explain why exercise may be under-utilised by GPs in the management of CKP.

2.6.2.4 Social influences: orthopaedic surgeons

Evidence currently suggests that there is little benefit of arthroscopy for most cases of CKP (41,182-184), therefore total knee replacement (TKR) surgery is the primary recommended surgical treatment for those patients whose symptoms cannot be controlled with conservative management approaches (2,184). Since TKR surgery

was introduced over 40 years ago, it has increased dramatically in both the UK (185) and USA (184); for example, 13,517 knee replacements were recorded in the National Joint Registry for England, Wales and Northern Ireland in 2003 rising to 82,267 in 2013 (185). Despite the increased rate of TKR surgery, its use does not appear to be consistently in line with guideline recommendations. An Australian study identified that a third of patients referred to orthopaedics for hip or knee OA had not previously undertaken any core conservative management approaches prior to referral (119). This may be due to GPs perceiving pressure from patients for an orthopaedic referral (186,187) or from a belief that TKR is the only effective treatment option for patients with CKP. A study examining the management of OA by GPs and orthopaedic surgeons identified that, despite the characteristics of patients seeing GPs and orthopaedic surgeons being similar, orthopaedic surgeons were more likely to use exercise, COX-II inhibitors, steroids and disease modifying osteoarthritis drugs and GPs were more likely to use NSAIDs (188). The ultimate decision regarding surgery is made by the surgeon with the patient and such decisions may be influenced by variable patient characteristics rather than clearly defined criteria (187,189). Therefore, it is possible that orthopaedic surgeons may influence GPs' future behaviour in either direction; i) suboptimal use of core conservative treatments by a GP may be perpetuated if the GP believes that surgery is the best treatment option and the decision to operate is made in the surgical consultation despite the lack of prior use of conservative approaches, however, ii) if GPs regularly note that the outcome of their referral to an orthopaedic surgeon is advice to exercise or referral to physiotherapy, they may start to consider this strategy prior to referral.

2.6.2.5 Social influences: summary

The evidence presented suggests that the overall impact of subjective norm from the various interactions that GPs have with professionals within the wider healthcare team and patients (see Section 1.3 and Section 2.6.5) may be negative. Studies have shown that the use of exercise for CKP patients is at best variable among key HCPs, there are data showing that exercise is generally underused and even among physiotherapists, the professional group that might be expected to most clearly champion the role of exercise, there is uncertainty about the role and safety of general exercise for patients with CKP.

2.6.3 The role of GPs in exercise for CKP

The underpinning model asserts that the role that an individual perceives that they hold influences their intention to undertake a specific behaviour (Figure 2-1). Although GPs are the primary source of formal medical advice for patients with CKP and exercise is a core treatment for CKP (see Chapter 1), GPs may not necessarily perceive their role to include initiating exercise in the management of these patients. As discussed in Section 2.6.1.1, this could be related to the GP's attitudes about candidacy of CKP in general; however, in the context of this PhD, relevant beliefs about role include GPs' beliefs about their role in initiating exercise for patients with CKP. Although current guidelines are positive about the candidacy of CKP, these guidelines do not clarify the roles of the HCPs that are potentially involved (44). Since other clinicians and other healthcare (and social care) services may be involved, lack of clarity about roles in the delivery of guideline recommended treatments risks the phenomenon Balint called '*collusion of anonymity*' (190). This refers to a situation when many people are potentially involved in the responsibility

for a particular action, no-one assumes overall responsibility, and thus, no action is taken.

GPs are a heterogeneous population with varied backgrounds and interests. Therefore, some GPs may be (or feel) unable to provide detailed, tailored exercise advice to patients. Exercise interventions may take a variety of forms (see Section 1.2.2.1), however not all current CKP guidelines specify the way in which the exercise intervention is provided. If this were clearer in all guidelines, the roles of various HCPs may be more explicit and GPs may feel more supported to initiate exercise (191).

Potential roles that a GP could undertake include: recognition that exercise is appropriate and communication of this to patients, offering brief advice about exercises that may be of benefit ('*advise*' exercise), referral of patients on to specialist services who can provide this exercise information, support and/or prescription and providing an individualised plan of exercises ('*prescribe*' exercise). Self-management could further be supported, in conjunction with any of the suggested roles, with provision of written information. The following sections consider the published literature relating to each of the potential roles, before a minimum expected role of GPs in initiating exercise in the management of CKP is suggested.

2.6.3.1 GPs could recognise that exercise is appropriate and communicate this to the patient

In line with OA-specific patient information (192), it is logical that GPs should be expected to recognise the need for, and promote the use of, local and general exercise among patients with CKP (193,194). Indeed, a leading UK physiotherapist in the field of OA suggested that failure to inform patients about physical activity and exercise when managing CKP, and failure to provide information on at least a few

standard exercises, constitutes '*professional negligence*' (52). The GPs' role beyond this first step is very poorly defined.

2.6.3.2 GPs should support self-management through provision of exercise information

Whatever the expected role of GPs is in initiating exercise for a patient with CKP, education about self-management is a core recommendation in the management of CKP (2). Therefore GPs should be supplementing any verbal exercise advice with written information (2), either paper-based or signposting to electronic resources. Written information can help to prevent intentional non-adherence by dispelling misunderstandings and concerns and it can prevent non-intentional non-adherence through prompting patients to undertake certain approaches or reinforcing the verbal information given in a consultation (76).

2.6.3.3 GPs could advise or prescribe exercise

As outlined at the end of Section 1.2.2.1, exercise advice and support need to be specific and individualised. In terms of what a GP actually *does* within a consultation, delivering exercise '*advice*' or an exercise '*prescription*' requires different levels of detail communicated to the patient, which, in turn requires different levels of expertise. For the purposes of this PhD, exercise '*advice*' is defined as a GP recommending a patient to exercise and perhaps providing broad categories of exercise to undertake; for example, '*you could try swimming*' or '*it may help to regularly undertake straight leg raises*'. An exercise '*prescription*' would result in the patient being given specific, clear information about the specific type, intensity, duration and frequency of exercise that should be undertaken (195). Akin to drug prescriptions, exercise prescriptions should be followed-up to assess tolerability,

effect (and adverse effects) and compliance and to adjust the treatment dose (i.e. exercise frequency or intensity) and/or type (15,196).

Since general exercise is a core management component of many primary care patient presentations, initiating or advising general exercise should be familiar to GPs (59). However, to maximise outcomes among patients with CKP, local strengthening exercises are also advocated in evidence-based recommendations (see Section 1.2.2.1) (8). Delivering an exercise prescription, and particularly one for specific lower limb exercises, requires time and a certain level of expertise, especially to ensure it is appropriately individualised to the patient's baseline levels of strength, range-of-movement, balance, exercise capacity and preferences. These factors of time and expertise may present barriers to exercise prescription being a realistic option for most GPs.

To clarify, exercise '*prescription'* should not be confused with '*exercise on prescription*', a scheme by which GPs can refer patients to local fitness programmes, in which case the type, duration and frequency of exercise is not prescribed by the GP. Thus, reference to '*exercise on prescription*' for the purposes of this PhD, is classed as the GP providing advice to exercise and/or referring for exercise. Whether provision of written information to a patient constitutes exercise advice or prescription is dependent upon the amount and type of information contained within the leaflet. However, if a '*prescription*' is considered to require an appropriate type, duration, intensity and frequency of exercise that is tailored to each individual patient, it is unlikely that an information leaflet that contains standardised advice and some exercises to try will constitute a suitably individualised exercise prescription. Thus for the purposes of this PhD, provision of information leaflets is classed as a form of advice to exercise rather than an exercise prescription.

2.6.3.4 GPs could refer patients with CKP for exercise

GPs should offer '*comprehensive care for all common problems; and to coordinate services when care from elsewhere is needed*' (197). Doctors who lack the expertise to initiate exercise programmes are expected to undertake appropriate referrals if services and patient care pathways allow this (192,198) and to ensure patients are seen by those best placed to meet their needs (193,199). However GPs have to carefully balance the fact that exercise *should* be offered to all patients with CKP (122) with their own expertise, judicious use of resources and patient preferences. CKP is common and onward referral to specialist services, such as physiotherapy, may be limited by capacity of the receiving services and financial restraints within the National Health Service (NHS) (200), for example through limits on the number of referrals commissioned or that can be afforded within defined budgets (201). Pragmatically it therefore seems appropriate to expect GPs to manage at least some CKP patients with exercise without the need for onward referral to other services.

2.6.3.5 A minimum expected role of GPs in initiating exercise for CKP

Given the lack of clarity about the roles of GPs within guidelines, varying experience of GPs and time constraints within consultations (see Section 2.6.5), expecting all GPs to provide specific, individualised exercise 'prescriptions' to all patients with CKP is unrealistic. GPs are expected to be patient-centred, comprehensive providers and coordinators of care to patients within the community, addressing acute and chronic conditions and promoting wellbeing within individuals, while also considering the wider population they serve (202,203). They should have '*reasonable care and skill in undertaking an assessment of the risk and benefits to the patient of exercising*' (59), should enable '*exercise participation where at all possible, as opposed to acting as the gatekeeper to participation*' (59) and should

facilitate self-management and provide information (204). It therefore seems appropriate that the minimum expected role of GPs in initiating exercise for CKP should be to:

- Identify exercise as a useful management option for all patients with CKP
- Consider any factors that would preclude the use of (certain types of) exercise in that particular patient
- Discuss exercise as a core management approach
- Provide written information to support this discussion

If GPs do not feel equipped to provide individualised, specific exercise '*prescriptions*' they should offer to signpost or refer the patient to others who can provide this, such as physiotherapists or other exercise specialists. GPs beliefs about their role need to be sought to identify differentials between such a minimum expected role and GPs' perceptions' of their role, which, if found, may help to explain why GPs may underuse exercise.

2.6.4 Characteristics of GPs that influence their use of exercise of CKP

The underpinning model proposes that GPs' personal characteristics influence their behaviours. For example, characteristics ranging from gender (which has previously been associated with differences in attitudes and behaviours (205)), years since qualification (GPs who have most recently qualified have previously been found to be most up-to-date with current guidelines (206)), location of the GP's practice (rural environments have previously been found to present greater barriers to access to physiotherapy (207)) through to the GPs' treatment orientation (see Section 2.6.1.1 and Section 4.2.3) may impact GPs' use or implementation of exercise for CKP. It may be assumed that GPs with special interests (GPwSI) in musculoskeletal conditions may have greater interest in CKP than the general GP population and

thus may be more up-to-date with current guidelines for musculoskeletal disorders. While this assumption is not consistently substantiated (208), compared with GPs who do not have particular clinical interests in musculoskeletal problems, GPwSI may differ in their management approaches (209) and beliefs (168). Personal experience of CKP may be expected to increase positive perceptions of candidacy, improve familiarity of appropriate management strategies and/or result in attitudes about the condition that are more in line with the evidence base, particularly if the GP has been investigating the condition for self-management reasons. However empirical work with GPs in the context of chronic LBP suggests that personal experience may not necessarily improve alignment with evidence-based management (164). Characteristics of GPs must thus be assessed within this PhD to identify the key characteristics that impact their attitudes, beliefs and behaviours in the context of exercise for CKP.

2.6.5 Beliefs about capabilities, including perceived behavioural control

Beliefs about capabilities and, the related issue of perceived behavioural control, '*the individual's perception that he or she can carry out the behaviour and overcome the obstacles that stand in the way of implementing it*' (137), may impact a GP's intention to use, and actual use of, exercise for CKP (131,138,147,148,150). For example, GPs may not initiate exercise if they are uncertain about the appropriate types of exercise (179) and/or the correct exercise '*prescription*' (43,210) or they believe they have insufficient expertise (or, from the TDF, skills) to initiate exercise (GP-related factors). It is acknowledged that the correlation between beliefs about one's own skills and one's actual skills is often imprecise (211), however, it is the GPs' perception (i.e. their confidence, their beliefs about their capability) that is the focus in the TDF (133) and thus this element of the underpinning model. GPs' beliefs about capabilities may also relate to system or organisational processes within

which they work (system-related factors). For example, they may not use exercise for CKP if they believe the systems are inadequate to support this. This may be due to insufficient opportunity to demonstrate exercises in the time available within their consultations (212), financial constraints, including perceived constraints on numbers of physiotherapy referrals allowed (201), and service constraints, for example long waiting lists (153,200,207,213-215) (contextualised within the TDF domain, environmental context and resources (133)). Finally, GPs may believe that providing advice to exercise is futile as they feel it is unlikely to elicit the behaviour change required in exercise activity among patients (patient-related factors) (216). While there is evidence that GPs may be able to overcome some patient-related factors, for example, primary care based interventions do seem to improve self-reported physical activity levels among the sedentary primary care adult population (68), such interventions are often intensive, involving multiple contacts, so may have little generalisability to a typical GP CKP consultation.

2.6.6 Habit and past behaviour

As part of Godin's hypothesised theoretical framework (131), habit and past behaviour was included in the underpinning model as a hypothesised predictor of behavioural intention and/or behaviour. This element suggests that, given a stable context, GPs are likely to (intend to) repeatedly perform the same behaviours (131). Godin et al could not identify sufficient evidence to confirm or refute habit/past behaviour as a strong predictor of behaviour/behaviour intention (131), and Ajzen highlights that past behaviour does not necessarily equate to habit (135). However, this element was included in the underpinning model because there is some evidence GPs' behaviour is predicted by past behaviour (for example, GPs' sickness certification behaviour in general was predictive of sickness certification for patients with LBP (217)), because Weinstein et al (218) cautioned overestimation of the

influences of perceptions on current behaviour if the effect of past behaviour is not controlled for and because habitual behaviour may be particularly resistant to change (131,219).

2.6.7 Behavioural intention

According to the underpinning model, GPs' intention to undertake a behaviour may be influenced by their intellectual agreement with best available evidence or clinical guidelines (awareness-to-adherence model) and by factors influencing motivation and goals (TDF). These elements will now be described.

2.6.7.1 Agreement with guidelines

The awareness-to-adherence model (134) predicts that GPs are more likely to adopt and adhere to best practice recommendations (i.e. undertake the specified behaviour), if they agree with guideline recommendations. GPs are more likely to agree with guidelines if they believe the underlying evidence applies to their particular patients (153), if they are derived from respected sources and they reflect their experience of clinical practice and their current behaviour (220). Agreement with guidelines may be undermined if recommendations are based on average, ideal or '*standard*' patients, who GPs feel may not actually exist (124,126), if guideline panels do not include a GP or if the primary-secondary care representation on the guideline panel appears biased (214) or if GPs perceive the guidelines to threaten their autonomy (126,220), the GP's ability to provide individualised care (220) and/or their doctor-patient relationship (166). In the context of CKP, problems with the agreement with guidelines may thus occur because only a minority of guideline development group members have been GPs (2,72) and because a trigger for a patient to consult may be an increase in pain severity (100). At this time the patient's primary concern may be for fast pain relief using medication (104,221) rather than

to be receptive to advice about complex behaviour change such as weight loss or changes in exercise and physical activity. As introduced in Section 1.2.2.1 the perception of more rapid onset of pain relief may be accurate as analgesics used in the context of a knee OA flare can elicit pain relief in just a few hours (73), in contrast to exercise, which may take weeks (although many studies do not investigate pain after a few days) (63) and following which pain may transiently increase (50,64,69).

2.6.7.2 Motivation and goals

The TDF highlights that motivation and goals influence behaviour (133). Such motivation may be intrinsic, that is the extent to which the GP feels they need to undertake the behaviour (that is they see it as a priority or is of interest to them), or extrinsic, such as the provision of incentives (133). In the clinical consultation, Michie et al (133) highlight that motivation and goals can be dynamic and are influenced by the presence of conflicting guidelines for comorbidities or the co-presentation of conditions that are seen as higher priority. While conflict between different guidelines are unlikely to be an issue in the context of exercise for CKP as exercise is a key component of the management of many long-term conditions, the relatively low importance placed on CKP by GPs, which was highlighted in Section 2.6.1.1 (155), may present a barrier to GPs intending to use, or actually implementing, exercise in the management of a patient with CKP.

2.6.8 Adopting and adhering to exercise recommendations

Within the underpinning model, intention to undertake a behaviour predicts that the behaviour will subsequently be undertaken (131). However, even if a GP intends to use exercise to manage CKP, to translate this intention into a clinical improvement for the patient, the GP must actually undertake this behaviour; initially adopting the behaviour and subsequently adhering to this management approach. While, the

GP's awareness and agreement with evidence-based guidelines is a very personal process, the adoption of, and adherence to, guidelines is complicated by the presence of the patient. GP consultations are complex, explicit interactions between patients (and/or a third party) and the GP. As the awareness-to-adherence model suggests, GPs are not actors undertaking a series of pre-defined processes, devoid of critical appraisal of the evidence and immune to the effect of the patient's individual requirements, preferences and wider influences. Both the patient and GP enter into consultations with past experiences and knowledge. They have attitudes and beliefs of, and previous experiences about, specific conditions and their management and will have typical behavioural approaches and individual preferences. Even when a GP is aware of and agrees with guidelines, GPs must effectively negotiate with, and educate patients about, the value of exercise, address any unhelpful beliefs or misunderstandings they may have and identify a way that the individual patient may be able to integrate effective, regular exercise into their lifestyle by considering and addressing the potential barriers to exercise that were outlined in Section 1.3. The complexity of all the processes involved in a GP consultation is beyond the scope of this thesis, however appreciating this complexity is vital to better understand why GPs' behavioural intention may not consistently predict behaviour within a consultation.

2.7 Chapter summary

No single theory of behaviour has been shown to robustly predict GPs' clinical behaviours. Therefore to try to more comprehensively consider a full range of influences on GPs' clinical behaviour, including their own attitudes and beliefs, and to develop a foundation for the empirical survey work described in Chapters 4-6, an underpinning model was developed. Three relevant theoretical models were drawn

upon to develop the underpinning model and relevant literature relating to each element of the model has been considered. The underpinning model was used in conjunction with the findings from the systematic review reported in the next chapter in order to focus the content of the questionnaire (Chapter 4) used in the pilot survey (Chapter 5) and the subsequent main survey (Chapter 6). The next chapter describes the systematic review that was designed to identify the existing empirical research evidence pertaining to the attitudes, beliefs and behaviours of GPs regarding exercise for CKP.

3 GPs' attitudes, beliefs and behaviours regarding exercise for chronic knee pain: a systematic review

Despite the uncontested evidence that exercise improves pain and function in CKP (8), and is a core management strategy recommended in multiple guidelines (2), there is evidence of underutilisation of exercise by patients (87) and evidence that GPs do not recommend exercise as often as they should (122). As indicated by the underpinning model (Chapter 2), a GP's attitudes and beliefs about exercise for CKP can influence their use of this management strategy. Therefore, robust assessment of the attitudes, beliefs and behaviours of GPs is required to identify whether their clinical behaviour is aligned with evidence-based recommendations and, if not, to understand why. To gain an accurate representation about what was already known about attitudes, beliefs and behaviours of GPs regarding exercise for CKP, a thorough literature search followed by assessment and assimilation of all relevant literature published to date was required. The most robust methodology to use to undertake this type of work is a systematic review. Therefore, before embarking on new data collection, the first objective of this PhD was to undertake a systematic review to describe what is currently known about the attitudes, beliefs and behaviours of GPs regarding exercise for CKP, to identify remaining uncertainties and to inform the later stages of this PhD.

3.1 Aim of the systematic review

To identify and synthesise available empirical research evidence that investigates the attitudes, beliefs and behaviours of GPs regarding exercise for CKP.

3.2 Methods

This systematic review was originally undertaken as part of an Academic Foundation Year 2 post from August 2007 to August 2008. The results of this review,

which included 20 papers, were presented at the Society of Academic Primary Care conference in July 2008 and published in BMC Family Practice in 2010 (1). Two updates to the review were undertaken within the timeline of the PhD, in August 2011 (26 papers included) and December 2014 (31 papers included), to identify and include any further articles published since the original review. As the methods used for all reviews were the same, this chapter describes the systematic review as one complete process.

3.2.1 Design

A single, perfect research methodology to investigate a specific topic is elusive as bias is hard to avoid. Indeed, a methodologically '*perfect*' study may not produce results that are clinically relevant or generalisable and results may be '*misinterpreted and misrepresented*' (222). Single studies usually are not taken to indicate the truth as different studies can result in '*conflicting conclusions*' (222,223); it is therefore accepted that a more accurate understanding of the answer to a research question can be identified by critically analysing the quality, and combining the results, of a number of studies (222,224,225). Synthesising the results of a number of studies can help to identify gaps or weaknesses in existing literature in order to better inform future research. In the context of this PhD, combining the results of all available studies presents the opportunity to develop a richer picture of the variability in attitudes, beliefs and behaviours of GPs, helped to refine the underpinning model described in Chapter 2 and informed design of the pilot and main surveys described in Chapters 4-6.

3.2.2 Search strategy

Search terms were chosen to identify research studies pertaining to CKP, exercise, GPs, attitudes or beliefs and behaviours, see Appendix 3 for a summary of the

search terms used. These search terms were developed by searching for documents using synonyms, noting the thesaurus headings that arose when '*exploding*' search terms and noting the keywords used from the relevant papers obtained. Therefore, for the final search, a comprehensive collection of search terms and synonyms were used to maximise detection of relevant papers.

The databases MEDLINE, EMBASE, PsychINFO and CINAHL were used. MEDLINE and EMBASE are both biomedical databases, covering a slightly different literature base and they were selected to detect papers with a focus on the clinical condition (i.e. CKP), and behaviours and professionals involved in managing this. PsychINFO is a database containing literature relating to behavioural sciences in general, linked with other disciplines including medicine. Therefore this was chosen to identify papers relating to attitudes and beliefs. Finally, CINAHL is a database for literature pertaining to nursing and allied health professionals, therefore relevant papers with a primary focus on physiotherapy or physiotherapists would be detected here. CINAHL is also one of the more robust databases for detecting qualitative studies (222), and thus was thought valuable in identifying attitudes and beliefs. Search terms were exploded and were also searched for as free-text keywords. Titles and abstracts were searched within papers listed in the database from inception to December 2014. At all stages of the literature search, no limitations were applied to research methodology or language.

Additional relevant papers were sought from reference lists of papers identified from the electronic search and selected for full text review and from colleagues who had identified them in previous CKP research. Papers that cited or were related to '*found*' papers were also searched for on PubMed and examined for appropriateness for inclusion. Duplicate papers were removed. Where two papers described the same

study they were both read to compare data (222) but were managed as one entity and both papers were referenced in the data extraction summary.

3.2.3 Study selection

In accordance with The Cochrane Collaboration (226) requirements for systematic reviews, eligibility criteria for the studies were defined prior to undertaking the search (see Box 3-1). The first phase of study selection involved titles and abstract review of identified citations (222). Papers failing to meet inclusion criteria and/or meeting at least one exclusion criterion were excluded and the reasons for exclusion were recorded. Potentially relevant papers published in non-English languages were translated. The full text, where available, of remaining citations was reviewed; exclusion and inclusion criteria were reapplied and non-relevant papers were excluded. The author of this thesis undertook the study selection process to this point. This process was not piloted prior to the original review therefore an approach of over-inclusion was taken so that clearly- and potentially-eligible papers were included for independent review by a second researcher to determine, through consensus, the appropriateness for study inclusion, to extract relevant data and undertake independent quality assessment. Papers that almost met inclusion criteria, but could not be included, were classed as ‘near misses’ (222). A summary of “near misses” is given in Appendix 3. Where needed, authors were contacted to clarify/request data. Study details such as author, institution, journal name and results were not masked during assessment of full text papers (222).

Box 3-1: Inclusion and exclusion criteria applied to studies identified in the literature search for the systematic review

Inclusion criteria:

- Empirical studies about knee pain, specifically CKP in adults over 45 years
- Relate to primary care
- Include information about exercise and about attitudes, beliefs and/or behaviours of GPs towards exercise for CKP

Exclusion criteria:

- Non-human subjects
- Refer to patellofemoral pain syndrome alone
- CKP due to trauma, malignancy, infection, inflammatory arthritis or secondary to other diseases
- CKP in a prosthetic joint

3.2.4 Quality assessment

Potentially relevant articles, meeting inclusion criteria, were assessed to identify the validity of findings and quality in general (226). The primary aim of quality assessment of included studies was to identify and consider, during the synthesis, possible sources of bias which may affect the generalisability and internal validity of the results. No studies were excluded on the basis of quality because this systematic review was designed to identify the range of documented attitudes, beliefs and behaviours of GPs.

Two quality assessment tools were used because the studies found included both qualitative and quantitative methodologies and because, when used together, all the key aspects of quality assessment outlined by the Centre for Reviews and Dissemination (CRD) guidance on systematic reviews were covered (222). The tools used, the Newcastle Critical Appraisal Worksheet (NCAW) (227) and the Critical Appraisal Skills Programme (CASP) Qualitative Research Assessment Tool (228), are provided in Appendix 3. The NCAW, designed for use with papers

reporting any study methodology, could be used with all papers identified in the systematic review. The CASP tool, designed for use with qualitative studies, was produced by a UK wide organisation which provides critical appraisal skills development support and tools which are widely used in healthcare (228). The inclusion of CASP prompted consideration of factors that are specific to qualitative studies, such as reflexivity and data saturation (229); thus not all fields of the CASP tool were relevant to all studies identified in this systematic review. Both the quality assessment tools were applied to all papers and the identified strengths, weaknesses and implications of these were compared.

All relevant studies were independently quality assessed by two people (the author of this thesis and one of the two supervisors for this PhD). Disagreements were noted and resolved through discussion by the initial two reviewers or by a third reviewer.

3.2.5 Data extraction

Primary data extraction from papers identified as being suitable for inclusion in the systematic review was undertaken by EC. A second reviewer (either ER or NF) independently checked data extraction for accuracy and completeness. For most of the studies identified, the relevant data comprised only very small components of the published paper. Therefore only a relatively simple data extraction tool was required and was developed on Microsoft Excel, to provide structure for identifying pertinent elements from the papers. This tool directed extraction of information regarding the author, title and source, confirmation of meeting the inclusion criteria (CKP, exercise, GP, behaviours, attitudes, patients aged ≥45 years, empirical study) and details about the study (study population, level of response, study tool, study method) and the data of interest, the attitudes and beliefs of GPs (e.g. whether

expressed or implied, nature of attitudes and beliefs about exercise, whether attitude and beliefs were regarding safety, appropriateness and/or effectiveness of exercise for CKP or guidelines recommending exercise) and/or the percentage of GPs who prescribed or advised exercise and/or the proportion of patients who received exercise interventions directly from the GP. A further column was used to insert any other comments that would be of interest during data synthesis.

Definitions of attitudes, beliefs and behaviours used were those given in Chapter 2. Attitudes and beliefs were identified from studies through self-report from the physicians being investigated and through implication by, for example, identifying physician behaviours that suggested a negative attitude about exercise, such as advising rest. Behaviours were either '*reported*' (or intended) or '*actual*' (or observed). Information provided by self-reports from physicians about clinical management constituted '*reported behaviour*'. Data obtained through direct observation, patient report or from case-note or medical record review were classified as '*actual behaviour*'.

3.2.6 Data synthesis

A narrative synthesis was the most appropriate approach for analysing the extracted qualitative and quantitative data. Pooling of results and undertaking formal statistical techniques, such as meta-analysis, was inappropriate as included studies did not provide multiple estimates derived from the same population (230). When undertaking a synthesis, the studies should not merely be collated and combined but the relative strength of the evidence and reasons for inconsistencies between studies need to be considered (222). A narrative synthesis does this by using words and text rather than statistical analyses (231). Guidance and frameworks exist to support syntheses, but these generally pertain to syntheses of interventional studies

(226,231). These were adapted for use in the context of this systematic review and this framework is presented in Table 3-1. The elements of this adapted framework were addressed in an iterative manner during the narrative synthesis (222).

Using the data extraction database, the preliminary synthesis (222) was undertaken. Implied and expressed attitudes and beliefs and reported and observed behaviours were grouped and summarised separately. Attitudes and beliefs were grouped according to whether data indicated positive, negative or ambivalent GP attitudes regarding exercise for CKP. Behaviours were summarised and described more quantitatively, such as proportions of GPs providing advice to exercise or providing a referral to another exercise provider (e.g. physiotherapist). Differences between the results were described and potential underlying reasons for such differences were sought, for example, differences in study methodology, type of information sought and study sample used. Results from the quality assessment process provided detail to further interpret the utility, generalisability and likely bias of study results and, thus, the overall quality of the data provided by each individual study.

Table 3-1 Framework for the narrative synthesis

Elements of analysis framework recommended by:		Adapted version used by this narrative synthesis
The Cochrane Collaboration	**The ESRC Methods Programme group – recommendations for effectiveness reviews**	
	Developing a theoretical model of how the interventions work, why and for whom	Not adapted as not an interventional study however, the work was approached with the prior expectation that GPs with positive attitudes and beliefs about exercise are more likely to use this approach in the management of patients with CKP as outlined in Chapter 2
What is the direction of effect? What is the size of the effect?	Developing a preliminary synthesis	What are the documented attitudes, beliefs and behaviours of GPs regarding exercise for CKP? What proportions of GPs have positive/negative attitudes or beliefs about and what proportion use exercise for CKP?
Is the effect consistent across studies?	Exploring relationships in the data	Are attitudes, beliefs and behaviours consistent across studies and is there any indication as to why any observed differences may have occurred?
What is the strength of evidence for the effect?	Assessing the robustness of the synthesis product	What is the strength of evidence for the attitudes, beliefs and behaviours for exercise for CKP?
Developed using the Cochrane Collaboration (226) and Economic and Social Research Council (ESRC) Methods Programme (231) recommendations for interventional studies		

3.3 Results

3.3.1 Included studies

After removal of duplicates, 2232 citations were identified. Thirty-one papers reporting 30 different studies undertaken between 1992 and 2014 fulfilled the eligibility criteria; see Figure 3-1 and Table 3-2. Seven contained data about attitudes and beliefs as well as behaviours of GPs. Of the 30 relevant studies, nine described attitudes and beliefs of GPs towards exercise for CKP (outlined in Table 3-3) and 28 described behaviours of GPs regarding exercise for CKP (outlined in Table 3-4).

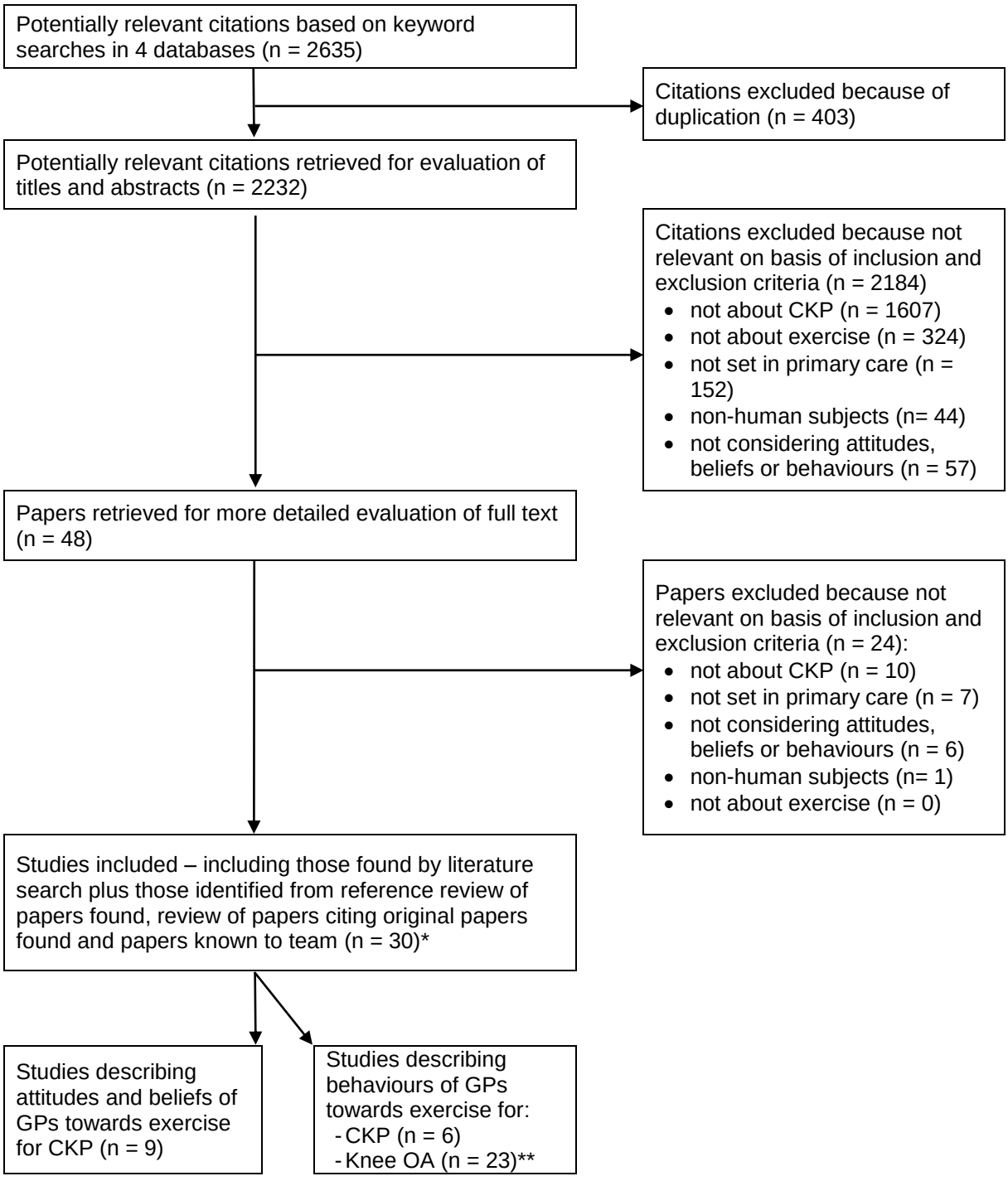
Of the 30 studies, five focused on the management of patients with CKP alone, 24 focused on patients with knee OA, symptoms of knee OA or a clinical diagnosis of

knee OA, and one differentiated between CKP and knee OA. The six studies that related specifically to CKP were UK-based studies. Definitions of CKP and knee OA used in many of the studies were unclear and/or inconsistent.

Of the nine studies investigating attitudes and beliefs, four were performed in France, two in Canada, one in the UK, one in the Netherlands and one in the USA. One of the four studies undertaken in France also included practitioners from Belgium, Italy, Spain and Switzerland. Ten of the 28 studies investigating the behaviour of GPs regarding exercise for CKP were conducted in the UK. Of the remaining studies, five were from the USA, four from France, two from Canada, two from Australia and one each from Netherlands, Germany, Czechoslovakia, Malaysia and Italy.

Multiple methods were used to investigate attitudes, beliefs and behaviours of GPs, sometimes within the same study, these included physician questionnaires (n=13), patient questionnaires (n=7) and interviews (n=5), case note reviews (n=5), physician interviews (n=2), physician focus groups (n=1), patient focus groups (n=1) and GP record of consultation on a proforma (n=1). Of all the included studies, only one explicitly used a behavioural theory, the TPB, to inform their study design (104). Of the remaining studies, nine made reference to elements of the underpinning theoretical model, for example, acknowledging that clinical behaviours can be influenced by GP factors such as attitudes, beliefs, '*cognitive rationales*' and confidence (165,178,232-235), organisational (235), patient (165,235,236) and guideline-related factors (237). Further one study examining patients' views of exercise also acknowledged that these may be influenced by experiences, opinions and feelings (98).

Figure 3-1 Flowchart summarising results of the literature search for attitudes, beliefs and behaviours of GPs about exercise for CKP



*Seven studies described both attitudes/beliefs as well as behaviours of GPs
**One paper described behaviours of GPs in relation to both CKP and knee OA

Table 3-2 Characteristics of included studies

Study	Year*	Country(ies)	Study population	Response	Study method	Data extracted	
						Attitudes and beliefs	Behaviours
Arshad A et al (238)	2008	Malaysia	200 GPs randomly selected from the 11 states in the peninsula of Malaysia from the Private Medical Practitioners Society (PMPS) database	90%	Physician questionnaire	No	Yes – knee OA
Bedson J et al (123)	2003	England and Wales	1000 randomly chosen full or part-time GPs in England and Wales	46%	Vignette-based physician questionnaire	No	Yes – CKP and knee OA
de Bock GH et al (232)	1992	Netherlands	Following record review, there was an investigation of policies of 14 Leiden GPs 196 records of patients with distal OA (93 had KOA) randomly selected by the 14 Leiden GPs	71%	Questionnaire completed through record review and semi-structured physician interview	Yes - explicit	Yes – knee OA
Bopf D et al (239)	2010	Australia	95 patients >50 years with provisional diagnosis of KOA without pre-existing inflammatory disease referred by their GP to Ipswich General Hospital in Queensland orthopaedic department outpatient waiting list	Unknown	Patient questionnaire	No	Yes – knee OA
Brand C et al (240)	2014	Australia	Patient data entered into BEACH programme relating to OA-knee problems	48% of all BEACH participants managed at least one OA-knee or OA-hip problem in their 100 BEACH encounters	GP record of consultation on paper and submitted to BEACH programme	No	Yes – knee OA
Chard J et al (180)	2002	UK	400 GPs in UK in association with Primary Care Rheumatology Society	27%	Physician questionnaire	No	Yes – knee OA

Chevalier X et al(241)	2004	France	4000 GPs across every region of the country	75%	Vignette-based physician questionnaire	Yes – implied	Yes - knee OA
Coyte et al (178)	1996	Canada	250 randomly selected GPs from Ontario	52%	Physician questionnaire	Yes - implied	Yes – knee OA
Denoeud L et al (165)	2005	France	1030 GPs randomly selected from database of all GPs in France provided details about their management of three consecutive outpatients with KOA within 8 weeks	94%	Physician questionnaire	Yes - explicit	Yes – knee OA
Dexter PA et al(121)	1992	USA	120 patients with hip and/or KOA recruited from 13 apartment complexes housing elderly persons, Midwestern city	92%	Patient interview	No	Yes – knee OA
Glauser TA et al (234)	2011	USA	152 randomly selected GPs from American Medical Association (AMA) Masterfile 2008, physicians invited until desired sample size achieved	Unknown	Vignette-based physician questionnaire	No	Yes – knee OA
Glazier RH et al (242)	1998	Canada	775 GPs from sample of 798 active Ontario members of the College of Family Physicians of Canada	68%	Vignette-based physician questionnaire	Yes - implied	Yes – knee OA
Günaydin I et al (243)	1997	Germany	252 GPs were selected at random in Baden-Wuerttemberg	44%	Vignette-based physician questionnaire	No	Yes – knee OA
Hendry M et al (98)	2006	UK	22 primary care patients with a diagnosis of KOA from five North Wales general practices	Not applicable (qualitative study)	Patient interview	Yes - implied	No
Jinks C et al (236)	2011	UK	679 adults ≥50 years registered at 3 general practices in North Staffordshire who reported knee pain and had had a recent GP appointment included	77% of which 10% responded to follow-up and had knee pain	Patient questionnaire and record review	No	Yes - CKP
Jordan KM et al (114)	2004	UK	828 patients with KOA and >55yr from two Wessex GP practices	56%	Patient questionnaire	No	Yes – knee OA

Linsell L et al (244)	2005	UK	Patient records from 604 GPs in 198 UK practices which use the MediPlus database. Records of 3152 patients presenting with new knee pain underwent 36 months follow-up	Not applicable	Prospective analysis of records in a PCP database	No	Yes – CKP
Linsell L et al (245)	2005	UK	612 (56% female) residents ≥65 years from Oxford Health Authority Register and reporting knee pain on most days for one month or longer in the past 12 months	66% of which 18% had knee pain	Patient questionnaire	No	Yes - CKP
Mamlin et al (246)	1998	USA	Randomly selected GPs in Indiana	33%	Physician questionnaire	No	Yes – knee OA
Maserejian N et al (235)	2014	USA	192 GPs in the USA	Not clear as number invited not given	Physician interview and questionnaire after watching two video based vignettes	Yes - implied	Yes – knee OA
Mazieres B et al (237)	2005	Belgium, France, Italy, Spain and Switzerland	30,000 GPs	7%	Physician questionnaire	Yes - explicit	No
Mazzuca SA et al (179)	1997	USA	419 patients looked after by a rheumatologist or GP in Indiana	Response rate not applicable as taken from patient sample for larger study	Patient questionnaire, physical examination and interview	No	Yes – knee OA
McHugh GA et al (247)	2007	UK	160 patients recruited from a hip or knee joint replacement waiting list in a regional orthopaedic centre	66%	Patient interview	No	Yes – knee OA
Mitchell HL et al (233)	2006	UK	Patients in two southeast London PCP practices	34% of which 49% had knee pain	Patient questionnaire	No	Yes - CKP

Pavelka K et al (176)	1995	Czechoslovakia	137 patients with KOA	Not clear as number invited not given	Patient questionnaire	No	Yes – knee OA
Poitras S et al (104)	2010	France	Seven GPs from the metropolitan region of Paris, recruited from a network of GPs with an interest in musculoskeletal disorders. Convenience sample of 11 patients who were known to the GPs	Not clear as number invited not given	Physician and patient focus group	Yes - explicit	Yes – knee OA
Porcheret et al (122)	2007	UK	Adults aged >50 years with knee pain from two general practices in North Staffordshire who responded to a postal survey	36%	Patient interview	No	Yes - CKP
Richette P et al (248)	2011	France	Random selection of 7451 GPs from the CEGEDIM registry	11%	Physician questionnaire	No	Yes – knee OA
Sarzi-Puttini P et al and Scarpa R et al (188,249)	2005	Italy	30,529 patients were enrolled by GPs, rheumatologists and orthopaedic surgeons. 12,827 had knee pain.	Unknown	Record review	No	Yes – knee OA
Walsh NE et al (250)	2010	UK	19 GP surgeries from a large city in Southwest England	58%**	Record review	No	Yes - knee OA

*Publication year; **Paper did not provide response rate but poster obtained from corresponding author stated 11/19 practices approached agreed to participate. CKP = chronic knee pain; GP = general practitioner (terminology includes primary care physicians and family physicians from non-UK studies); OA = osteoarthritis

Table 3-3 Summary of attitudes and beliefs of GPs towards exercise for CKP, quality assessment and additional features of the studies that were taken into account when synthesising the included studies

Study	Type of exercise under investigation*	Findings*	Limitations to quality of the paper	Additional study features
Explicit attitudes and beliefs				
de Bock GH et al 1992 (232)	"Referral…to a physical therapist" "Provided patient information…patient education" (which included education on exercise)	"Physical therapy is less harmful than medical therapy" "[physical therapy is] unable to change the osteoarthritic symptoms" "different Dutch [GPs] have different policies…in one [GPs] there is a variation in policy not dependent on the patients' symptoms…the very divergent rationales and attitudes of [GPs] result in very divergent policies"	Confounding factors not considered, small sample size, lack of information about patient selection and number of PCPs invited to participate. Potential for bias.	
Denoeud L et al, 2005 (165)	"Optimal management of knee OA requires a combination of pharmacological and non-pharmacological treatment modalities. Non-pharmacological treatment of knee OA should include regular education, exercise, appliances and weight reduction"	99% (n = 954) agreed with the recommendation that includes the use of exercise for knee OA and 97% (n = 924) reported that they intended to apply this recommendation.	Confounding factors not considered Potential for bias.	Of those who didn't intend to apply the recommendations the reasons given included "recommendations did not consider the patient's opinion", "too rigid", thought they "contraindicated information provided by pharmaceutical industry".
Mazieres B et al, 2005 (237)	GPs asked to express their use of "exercise" as a treatment modality GPs asked to express the extent to which they agree with the EULAR recommendation "exercises, especially those directed towards increasing strength of quadriceps and/or preserving normal mobility of the knee, are strongly recommended"	For exercise GPs gave a mean score of 77/100 [SD 21] where 0 = I do not recommend its use and 100 = I do recommend its use. GPs gave a mean score of 84/100 [SD 16] in agreement with the EULAR guidance to recommend exercise.	Confounding factors not considered, study sample from scientific societies and low response rate. Potential for bias.	

Poitras S et al, 2010 (104)	“Exercises”	'There was disagreement amongst GPs on the impact of activity on knee OA, some citing benefits on knee mobility and general well-being, and others emphasizing potential further damage to the knee' 'Some GPs believed recommending activity maintenance could create unrealistic expectations and discouragement in patients that were too disabled' 'GPs generally agreed with the recommendation that patients practicing a physical activity with exposure to trauma should be encouraged to change the activity' 'Most GPs...[held the view] that physiotherapists had the knowledge and experience to provide exercise guidance more adequately than they could' 'Some GPs believed physiotherapy involvement was necessary to motivate the patient and manage the exercise program' 'GPs generally [stated] that exercise benefits could be obtained through activities of daily living' '...the capacity of patients to perform regular exercise depended on various factors such as the severity of disability, age, general health status, and motivation' 'GPs were unclear on the amount and type of activity necessary to obtain benefits without further damaging the knee'	Study sample from specialist group of GP from limited geographical area and number of GPs approached not provided Potential for bias.

Implied attitudes and beliefs (interpretation of data given in shaded area)				
Chevalier X et al, 2004 (241)	"Strict bed rest" "Exercise and physiotherapy"	1.8% of GPs suggested bed rest for mild OA symptoms, 10% suggested bed rest for moderate OA symptoms and 24% suggested bed rest for severe symptoms This may indicate an implied negative attitude towards exercise for knee OA and/or the belief that exercise may be harmful.	Use of multiple-choice questions, confounding factors not considered, limited information about the sampling method and use of a drug company to recruit physicians. Potential for bias.	Vignettes used mechanical pain without acute exacerbation for the mild and moderate stages of OA symptoms and with an acute exacerbation in the severe stage
Coyte et al, 1996 (178)	"Prescribe or instruct in physical therapy"	1% GPs stated that they "never or rarely" initiated physical therapy for patients with moderate to severe knee OA. This may indicate a negative attitude towards exercise for severe knee OA.	Use of Likert scale, confounding factors not considered, sample contained only active members of the Ontario College of Family Practitioners and low response rate. Potential for bias.	
Glazier RH et al, 1998 (242)	"Recommend exercises" "Recommend rest" "Referrals physiotherapy"	29% recommended rest for knee OA. This may indicate an implied negative attitude towards exercise for knee OA and/or the belief that exercise may be harmful.	Use of multiple-choice management options, confounding factors not considered and differences found between non-respondents and respondents regarding certification status with the College of Family Physicians of Canada. No information was given on statistical analyses.	

			Potential for bias.
Hendry M et al, 2006 (98)	"Exercise was broadly defined to include attending a gym, brisk walking, cycling or participating in sports as well as 'therapeutic exercises' prescribed by a health professional."	"Exercise advice – advice from health professionals was mainly in favour of exercise and consisted of encouragement to exercise, advice about specific exercises and referral to a gym. Sometimes the advice was vague or absent." "Occasionally exercise was discouraged" with a patient reporting a "[hospital doctor] said 'the walking's agitating your, your joints, so stop it" and "at the hospital they told me I shouldn't overdo exercise, I should look after my knees". This may indicate a range of implied attitudes towards exercise for knee OA from positive to negative.	Recruitment occurred through gyms, use of a limited geographical area and use of a small sample size. Potential for bias.
Maserejian N et al (235)	''...counselled...patients....to increase their rest"	8.3% GPs and 11.5% GPs counselled male and female patients, respectively, to increase their rest This may indicate a negative attitude towards exercise for knee OA	Use of vignette and prompts about lifestyle risks social desirability bias, unclear response rate and potential for reporting bias Potential for bias

*Direct quotes from papers have been placed in quotation marks, these may be examples of attitudes or beliefs that have been implied or they demonstrate the exact wording used in the study. ** Data of implied belief extracted from information given in study thus may be open to inaccuracy. CKP = chronic knee pain; GP = (terminology includes primary care physicians and family physicians from non-UK studies); OA = osteoarthritis

Table 3-4 Summary of behaviours of GPs regarding exercise for CKP, quality assessment and additional features of the studies that were taken into account when synthesising the included studies

Study	Type of behaviour under investigation*	Findings*	Limitations to quality of the paper	Additional study features
Studies investigating physician behaviour regarding patients with CKP				
Bedson J et al, 2003 (123)	"Advice on knee joint exercises" Referral to "physiotherapy"	54% stated they would refer to "physiotherapy" and 59% stated they would provide "advice on knee joint exercises".	Low response rate. Potential for bias.	The definition of CKP used was chronic knee pain in the absence of joint stiffness, crepitus, soft tissue swelling and quadriceps weakness
Jinks C et al 2011 (236)	"Referral (physiotherapy)"	36% referred to physiotherapy	Sample from limited geographical area, potential for limited external validity and possible response bias Potential for bias.	
Linsell L et al, 2005 (244)	"Physiotherapy"	17.7% had received physiotherapy at 36 months	Confounding factors not considered. Potential for bias.	
Linsell L et al 2005 (245)	"Referred to a physiotherapist"	27% referred to a physiotherapist	Confounding factors not considered, sample from limited geographical area and patients with only knee (not hip and knee OA) included. Potential for bias	
Mitchell HL et al, 2006 (233)	"Referred to physiotherapy"	21% referred for physiotherapy	Confounding factors not considered, sample from limited geographical area and low response rate. Potential for bias.	
Porcheret et al, 2007 (122)	"Exercise (excluding advice by physio)" "Physiotherapy referral"	46% advised exercise 40% referred to physiotherapy For both of the above, the proportion advised to exercise or referred to physiotherapy by their GP cannot be determined.	Sample used teaching practices and response rate low Potential for bias.	

Studies investigating physician behaviour regarding patients with knee OA				
Arshad A et al, 2008 (238)	"Advised exercise" "Referral for physiotherapy"	27% advised exercise 10% referred for physiotherapy	Sample small and from limited geographical area. Uncertainty regarding how representative the sample is of all GPs in Malaysia as unclear how many GPs registered on the PMPS database Potential for bias.	
Bedson J et al, 2003 (123)	"Advice on knee joint exercises" Referral to "physiotherapy"	44-48% stated they would refer to "physiotherapy" and 66-76% stated they would provide "advice on knee joint exercises".	Response rate low Potential for bias.	The definition of knee OA used was chronic knee pain associated with joint stiffness, crepitus, soft tissue swelling and quadriceps weakness
de Bock GH et al 1992 (232)	"Referral…to a physical therapist" "Provided patient information…patient education" (which included education on exercise)	In 63% cases GPs referred patients to physiotherapy Patient education was given in 32% cases.	Confounding factors not considered, small sample size, lack of information about patient selection and number of GPs invited to participate. Potential for bias.	
Bopf D e al (239)	"...tried physiotherapy"	41% patients had tried physiotherapy	Risk of recall bias, response rate not given, sample from small geographical area and from potentially more severely affected population. Potential for bias.	Denominator used for treatment strategies was number of knees affected, not number of people.
Brand C et al (240)	Referrals to physiotherapists as a proportion of all referrals Record of therapeutic exercise/ rehabilitation Record of counselling which included diet, exercise and lifestyle	18% of all referrals for knee OA were to physiotherapy which equates to 3% of knee OA encounters Therapeutic exercise/rehabilitation was recorded in 4% knee OA encounters Counselling was recorded in 15% contacts	Potential for under-reporting of exercise if >2 non-pharmacological approaches used, previously tried approaches not captured and thus cannot tell what proportion over time are advised each approach. Potential for bias.	The GP could record ≤4 medications and ≤2 non-pharmacological treatments and referrals were also documented. There is a risk of under reporting use of exercise if other non-pharmacological treatments given.

Chard J et al, 2002 (180)	Provision of or referral to “physiotherapy”	99% stated they would provide or refer for physiotherapy	Questions asked about ever use of management approaches (“do you ever provide or refer…”), confounding factors not considered, sample from specialised group and low response rate. Potential for bias.	
Chevalier X et al, 2004 (241)	“Strict bed rest” “Exercise and physiotherapy”	9% stated they use exercise as first line treatment for mild knee OA Under 15% stated they use exercise as a first line treatment for knee OA of any severity	Use of multiple-choice questions, confounding factors not considered, limited information about the sampling method and use of a drug company to recruit physicians. Potential for bias.	Vignettes used mechanical pain without acute exacerbation for the mild and moderate stages of OA symptoms and with an acute exacerbation in the severe stage
Coyte et al, 1996 (178)	“Prescribe or instruct in physical therapy”	89% GPs stated they “often or always” initiate physical therapy for patients with moderate to severe knee OA, 10.2% stated they “sometimes” do this.	Use of Likert scale, confounding factors not considered, sample contained only active members of the Ontario College of Family Practitioners and low response rate. Potential for bias.	
Denoeud L et al, 2005 (165)	“Prescribed…physical exercise”	49% “prescribed” exercise	Confounding factors not considered Potential for bias.	
Dexter PA et al 1992 (121)	“Ever received a recommendation from a physician for knee…exercises”	42% of the total group of patients and 49% of the patients currently seeing a physician for a joint problem, recalled ever receiving medical advice to exercise. 26% patients who had only seen an internist or GP, remembered receiving a recommendation for exercise	Sample from a limited geographical area and lack of information on the total number of patients screened and invited to participate. Potential for bias.	

Glauser TA et al, 2011 (234)	"Strength, flexibility and balance programme" "Physical therapy maintenance programme"	Using 10 point scale indicating likelihood of using treatment option in the future – 28-36% scored likelihood of 8-10 for using strength, flexibility and balance programme, 46-59% scored likelihood of 8-10 for using physical therapy maintenance programme	Use of 'likelihood of use' questions, lack of information how participants were compensated for taking part, uncertain how representative the AMA Masterfile is of all American GPs and lack of clarity about figures presented in the results as there appeared to be some inconsistencies Potential for bias.	Cases were mild-to-moderate knee OA. From the paper it appears that pharmacological treatments were presumed to be first line with alternative treatment strategies being utilised 'in the future' Lower likelihood of using exercise programmes in a case of bilateral knee OA with a large effusion on one side, a higher likelihood in a case of mild knee OA and previously non-adherent to regular physical therapy
Glazier RH et al, 1998 (242)	"Recommend exercises" "Recommend rest" "Referrals physiotherapy"	33.1% recommended exercises for knee OA 54.2% referred to physiotherapy	Use of multiple-choice management options, confounding factors not considered and differences found between non-respondents and respondents regarding certification status with the College of Family Physicians of Canada. No information was given on statistical analyses. Potential for bias.	
Günaydin I et al, 1997 (243)	"Physiotherapy"	77% stated they would refer a patient with knee OA for physiotherapy.	Sample from a limited geographical area and lack of information about non-responders. Potential for bias.	
Jordon KM et al, 2004 (114)	"Hospital physiotherapist" "Community physiotherapist"	13% had received physiotherapy from either hospital or GP referrals. The proportion of consultant and/or GP referrals to physiotherapy could not be determined.	Sample from practices with on-site physiotherapy assessment and direct access to hospital physiotherapy services, moderate response rate and non-responders were older than responders. Potential for bias.	

Mamlin et al, 1998 (246)	“Prescribe or instruct in physical therapy”	GPs prescribed or instructed physical therapy for 25% of patients with severe knee OA	Use of multiple-choice management options, confounding factors not considered and poor response rate. Potential for bias.	Physicians were asked to report a percentage of patients for whom they recommended a particular therapy and the mean percentages were recorded
Maserejian N et al (235)	“...advised to exercise...” “...counselled to undertake physical therapy...”	30% advised to exercise 13% male and 15% female patients counselled to undertake physical therapy	Use of vignette and prompts about lifestyle risks social desirability bias, unclear response rate and potential for reporting bias Potential for bias	
Mazzuca SA et al, 1997 (179)	“Aerobic activity (e.g. walking)” “Isometric quadriceps (strength)” “Range of motion (flexibility)”	52% advised aerobic activity by GP 19% advised range of motion by GP 12% advised isometric quadriceps by GP	Sample recruited from volunteering family physicians. Potential for bias.	
McHugh GA et al, 2007 (247)	“Physiotherapy treatments”	56% people waiting knee replacement had been referred to a physiotherapist by their GP**	Confounding factors not considered, a third of eligible patients did not respond to initial invitation to participate, sample from a limited geographical area and concentrated on patients with severe disease only Potential for bias.	
Pavelka K et al, 1995 (176)	“Physical treatment”	62% patients of a group of 20 doctors, consisting mainly of GPs, received physical treatment	Lack of information on how the authors collected/recorded data on treatment modalities, the sampling method and response rates. Potential for bias.	Authors state in the introduction that physiotherapy involves exercises to increase strength of quadriceps and hamstrings
Poitras S et al, 2010 (104)	“Exercises”	“Most patients mentioned GPs rarely provided specific instructions for exercises” “most [patients] reported that clinicians usually prescribed exercise instructions rather than discussing the issue”	Study sample from specialist group of GP from limited geographical area and number of GPs approached not provided Potential for bias.	

Richette P et al, 2011 (248)	"Exercise" "Physical therapy"	34% recommended exercise 34% recommended physical therapy	Low response rate and uncertainty about representativeness of the sample as lack of information about the proportion of GPs registered on the CEGEDIM database Potential for bias.	The paper refers to a response rate of 67% but this is 67% of the 16% of GPs who agreed to participate when asked, thus equating to 11% of all GPs originally approached
Sarzi-Puttini P et al, 2005 and Scarpa R et al 2005 (188,249)	"Exercises"	6% "prescribed" exercise by PCPs	Lack of information about the study type, outcome factors, sampling methods and response rates (although information could be found in accompanying papers). Confounding factors not considered. Potential for bias.	
Walsh NE et al, 2010 (250)	"Physiotherapy"	31% of patients referred to physiotherapy	Sample from limited geographical area and lack of information about how practices who refused to participate differed from participants. Potential for bias.	27% of patients referred to orthopaedics had not received physiotherapy

*Direct quotes from papers have been placed in quotation marks, these may be examples of attitudes or beliefs that have been implied or they demonstrate the exact wording used in the study. **Paper stated 48% of patients awaiting hip or knee replacement were referred to physiotherapy, the figure for those awaiting knee replacement alone were obtained directly from the corresponding author. CKP = chronic knee pain; GP = general practitioner (terminology includes primary care physicians and family physicians from non-UK studies); OA = osteoarthritis

3.3.2 Attitudes and beliefs concerning exercise

Of the nine studies reporting attitudes of GPs towards exercise for CKP, five used physician-completed questionnaires (165,178,237,241,242), two used physician interviews (232,235), one used patient interviews (98) and one used both physician and patient focus groups (104). Of these, four directly investigated the attitudes of GPs about the safety (104,232), appropriateness (104) and effectiveness (232) of exercise for CKP, how it should be delivered and by whom (104), and agreement with recommendations which include using exercise for CKP (165,237). Of the remaining five studies, attitudes of GPs were indirectly gained. Patient interviews provided indications of attitudes according to whether or not exercise had been encouraged or discouraged (98) and physician questionnaires indicated a negative attitude towards exercise when GPs suggested rest rather than exercise for CKP (178,235,241,242).

A wide range of attitudes of GPs towards exercise for CKP was highlighted, from GPs believing exercise should not be used i.e. they advised rest (235,241,242), to almost total agreement with guideline recommendations for the use of exercise for CKP (165). Of the nine studies that investigated attitudes and beliefs of GPs towards exercise for CKP, three implied negative attitudes by 2-29% of GPs suggesting rest (235,241,242) and 1% of GPs reporting that they would 'never or rarely' use physical therapy for this problem (178). Patient report (98) and physician focus groups (104), highlighted both positive and negative attitudes of GPs towards the safety, effectiveness and appropriateness of exercise for CKP. A more ambivalent attitude was also observed with GPs believing that physiotherapy was less harmful than pharmacological therapy (232).

No studies examined the explanations underlying the reported attitudes. However, published discussions within the studies included in this systematic review suggest factors that may negatively affect GP's attitudes towards using exercise for CKP and these included exposure to contradictory information (165), concern about lack of efficacy (232), and potential for harm (242) which all relate to beliefs about consequences in the underpinning model, and negative opinions about the capacity of patients to undertake exercise (104), which relates to beliefs about capabilities in the underpinning model.

3.3.3 Behaviours concerning exercise

Among the 28 studies investigating behaviour of GPs regarding exercise for CKP, 12 presented information on '*reported*' behaviours (123,165,178,180,234,235,238,241-243,246,248). Two studies provided data on both actual and reported behaviours; one used both physician and patient focus groups (104), the other used physician interview plus medical record review (232). The remaining 14 studies detailed '*actual*' behaviour using; patient questionnaires (n=5) (114,176,233,245), patient interviews (n=3)(121,122,247), case note review (n=3) (244,249,250), reporting of consultation using a proforma (n=1) (240), patient questionnaire and record review (n=1) (236) and patient questionnaires and interviews (n=1) (179).

These studies suggest variable inclusion of exercise by GPs in the management of CKP. Although 99% of GPs reported *ever* providing advice about exercise or referring a patient with CKP to a physiotherapist (180), the frequency of actual provision of exercise advice or physiotherapy referral was lower. Estimates of provision of exercise advice and physiotherapy referral were generally higher for physician questionnaire-based studies (exercise advice 9-89%

(123,165,178,232,235,238,241,242,246,248); physiotherapy referral ranged between 10-77% (123,233,235,238,242,243,248)) when compared to estimates arising from studies examining actual behaviour (exercise advice 4-52% (121,122,179,188,240,249); physiotherapy referral 3-63% (114,122,176,232,233,236,239,240,244,245,247,250)). Of the studies specifically concentrating on CKP, 18-40% of patients had received or been referred for physiotherapy (122,233,236,244,245), 54% of GPs stated they would refer to physiotherapy and 59% stated they would advise on knee joint exercises for such patients (123).

3.3.4 Quality assessment

Both quality assessment tools (227,228) highlighted similar strengths and weaknesses of the included studies. Disagreements between assessors occurred in only 60/1240 (5%) of initial decisions and all were resolved through discussion. A summary of the agreed quality assessment results using the NCAW (227) is provided in Table 3-5. Further comments about quality of the individual studies are provided in Table 3-3 and Table 3-4. No papers were excluded on the basis of quality.

All papers clearly stated the research question, study type and outcome measures. Many (16/30) papers failed to provide details of ethical approval, and whilst most (29/30) described their sampling frame, many used small samples of specialist groups or volunteers in limited geographical areas which risks selection bias (251) and/or limits generalisability of findings to a wide GP population. Studies often failed to discuss the researcher-participant relationship (e.g. in qualitative studies included), or how the study tools were developed.

Most studies had low response and/or follow-up rates and were therefore open to response bias. Response rates ranged from 7-94% for studies examining GPs' attitudes towards exercise for knee OA and from 11-94% for studies investigating behaviour. Nine of the 21 (43%) studies for which response rates were relevant and provided had a response rate lower than 50%. Few studies explored the extent and/or impact of response bias. As it is likely that responders are more interested in the topic than non-responders (252,253), attitudes, beliefs and behaviours of GPs participating in studies may be more in line with best-evidence recommendations than the reality across the wider GP population.

Data collection methods such as use of multiple-choice response options, and Likert-scales may promote over-reporting of actual behaviours by prompting recognition of appropriate, perhaps desirable, responses (254) rather than requiring respondents to independently recall relevant information about what they usually do. However, even if frequency of use of particular approaches do differ, the overall picture and type of responses have been found not to differ greatly between open and multiple response option questions (255). Further, studies that asked GPs about their likely use '*in the future*' (234) or if they had '*ever used*' (180) certain management strategies, are likely to have over-estimated the use of exercise. Such questions also fail to identify the reasons why these approaches would be used, the frequency of use and the circumstances in which they would be utilised. Recall bias is inherent in any study relying on patient or HCP report (251).

Linsell et al (244) and Denoeud et al (165) were the two papers selected as having the lowest risk of bias because the only significant quality issues detected with these were that confounding factors were not considered. These papers reported 18% of patients having received physiotherapy during the 36 month follow up period (244) and 49% GPs reporting to prescribe exercise in the management of three

consecutive outpatients with knee OA (165). The behaviour reported by these papers deemed to be highest quality was not outwith the range implied by all the papers included in the review. However, the highly positive attitudes also reported by Denoeud et al (165) regarding agreement with the recommendation that includes the use of exercise for knee OA (99%) and high levels of intention to use this recommendation (97%) were outliers amongst other attitudes identified within the systematic review but this may be because of the generalised nature of the question, rather relating to use in a specific context or with a particular patient.

Table 3-5 Quality assessment of papers found using The Newcastle Critical Appraisal Worksheet

Item being examined →	Research question			Study type			Outcome factors			Confounders			Sampling			Internal validity			Statistical tests			Significant results (clinically/ socially)			Ethical issues			Conclusions		
Author ↓	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**
Arshad	Y	N	N	Y	N	N	Y	N	N	Y	Y	Y	Y	Y	Y	Y	N	N	N	N	N	Y	Y	N	N	N	N	Y	N	N
Bedson	Y	N	N	Y	N	N	Y	N	N	N	Y	Y	Y	N	N	Y	Y	Y	Y	N	N	Y	N	N	N	N	N	Y	N	N
De Bock	Y	N	N	Y	N	N	Y	N	N	N	Y	Y	Y	Y	Y	N	Y	Y	Y	N	N	Y	N	N	N	N	N	Y	Y	Y
Bopf	Y	N	N	Y	N	N	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	N	N	N	Y	Y	Y	Y	Y	Y	N	N	Y	N	N
Brand	Y	N	N	Y	N	N	Y	Y	Y	Y	Y	Y	Y	N	N	Y	N	N	Y	N	N	Y	N	N	Y	N	N	Y	N	N
Chard	Y	N	N	Y	N	N	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	Y	Y	N	N	N	N	N	N
Chevalier	Y	N	N	Y	N	N	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	N	N	N	N	N	Y	N	N	N	N	N	Y	N	N
Coyte	Y	N	N	Y	N	N	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	N	N	Y	N	N	Y	N	N
Denoeud	Y	N	N	Y	N	N	Y	N	N	N	Y	Y	Y	N	N	Y	N	N	Y	N	N	Y	N	N	N	N	N	Y	N	N
Dexter	Y	N	N	Y	N	N	Y	N	N	Y	N	N	Y	Y	Y	Y	Y	Y	Y	N	N	Y	N	N	N	N	N	Y	N	N
Glauser	Y	N	N	Y	N	N	Y	Y	N	N	Y	Y	Y	Y	Y	N	Y	Y	Y	N	N	Y	N	N	N	N	N	Y	Y	Y
Glazier	Y	N	N	Y	N	N	Y	Y	Y	N	Y	Y	Y	N	N	Y	N	Y	Y	Y	Y	Y	N	N	N	N	N	Y	N	N
Günaydin	Y	N	N	Y	N	N	Y	N	N	Y	N	N	Y	Y	Y	Y	Y	Y	Y	N	N	Y	N	N	N	N	N	Y	N	N
Hendry	Y	N	N	Y	N	N	N/ A	N	N	N/ A	N	N	Y	Y	Y	N/ A	N	N	N/ A	N	N	Y	N	N	Y	N	N	Y	N	N
Jinks	Y	N	N	Y	N	N	Y	N	N	Y	N	N	Y	Y	Y	Y	Y	Y	Y	N	N	Y	N	N	Y	N	N	Y	N	N
Jordon	Y	N	N	Y	N	N	Y	N	N	Y	N	N	Y	Y	Y	Y	Y	Y	Y	N	N	Y	N	N	Y	N	N	Y	N	N
Linsell (a)	Y	N	N	Y	N	N	Y	N	N	N	Y	Y	Y	N	N	Y	N	N	Y	N	N	Y	N	N	Y	N	N	Y	N	N
Linsell (b)	Y	N	N	Y	N	N	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	N	N	Y	N	N	Y	N	N

Mamlin	Y	N	N	Y	N	N	Y	Y	Y	N	Y	Y	Y	N	N	Y	Y	Y	Y	N	N	Y	N	N	N	N	N	Y	N	N
Maserejian	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	Y	Y	Y	N	N	Y	N	N	Y	N	N
Mazieres	Y	N	N	Y	N	N	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	N	N	N	N	N	Y	N	N
Mazzuca	Y	N	N	Y	N	N	Y	N	N	Y	N	N	Y	Y	Y	Y	Y	Y	Y	N	N	Y	N	N	N	N	N	Y	N	N
McHugh	Y	N	N	Y	N	N	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	N	N	Y	N	N	Y	N	N
Mitchell	Y	N	N	Y	N	N	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	N	N	Y	N	N	Y	N	N
Pavelka	Y	N	N	Y	N	N	Y	Y	Y	Y	N	N	Y	Y	Y	N	Y	Y	Y	N	N	Y	N	N	N	N	N	Y	N	N
Poitras	Y	N	N	Y	N	N	Y	N	N	N	Y	Y	Y	Y	Y	N	Y	Y	N/A	N/A	N/A	Y	N	N	Y	N	N	Y	N	N
Porcheret	Y	N	N	Y	N	N	Y	N	N	N	N	N	Y	Y	Y	Y	Y	Y	Y	N	N	Y	N	N	Y	N	N	Y	N	N
Richette	Y	N	N	Y	N	N	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	N	N	Y	N	N	Y	N	N
Sarzi-Puttini	Y	N	N	Y	N	Y	Y	Y	Y	N	Y	Y	N	Y	Y	N	Y	Y	N	Y	Y	Y	N	N	N	N	N	Y	N	N
Walsh	Y	N	N	Y	N	N	Y	N	N	Y	Y	Y	Y	Y	Y	N	Y	Y	N	N	N	Y	N	N	N	N	N	Y	N	N

For each aspect of the quality assessment three questions were asked, each number in the above table corresponds to each question: 1. Can you find this information in the paper? 2. Is the way this was done a problem? 3. Does this problem threaten the validity of the study? Linsell (a) (244), Linsell (b) (245). Green shading shows desirable score, red shading indicates undesirable score, yellow shading indicates score not applicable.

3.4 Discussion

Research evidence and therefore best-practice guideline recommendations emphasise exercise as a core management strategy for CKP in primary care. This systematic literature review was conducted to understand what is known about the attitudes, beliefs and behaviours of GPs regarding the use of exercise for CKP.

3.4.1 Summary of results

This systematic review identified a paucity of studies directly investigating attitudes and behaviours of GPs regarding exercise for CKP. There was much heterogeneity in the methods used within included studies, including qualitative and quantitative study designs and use of size- or geographically-limited and/or specialised samples, which meant that meta-analysis was inappropriate and two quality assessment tools had to be used. Most studies used descriptive questionnaire or interview methods to investigate GPs' attitudes, beliefs and behaviours.

GPs' attitudes and beliefs towards exercise for CKP appear to be diverse, ranging from negative attitudes implied through advice to rest (241,242), reports of '*never or rarely*' using physical therapy for moderate to severe CKP (178) and beliefs that exercise does not change the symptoms (104,232) or may worsen CKP (104), through to positive attitudes demonstrated through encouragement to exercise, explicit statements about the safety (232) and efficacy (104) of exercise and overall agreement with recommendations that management of CKP should include exercise (165,237). It appears that GPs' use of exercise for CKP is highly variable, but overall it is often underused, under-advised and/or under–prescribed. Due to quality issues of the included studies such as use of specialist groups of GPs and low response rates, this review probably over-estimates the exercise behaviour amongst GPs since respondents tend to be more interested in and/or confident

about the research topic and thus are more likely to be familiar with best evidence recommendations than non-respondents (256,257).

3.4.1.1 Consistency within and between studies: variations in study designs

Studies with a variety of different research designs, investigating a number of different types of attitudes and beliefs over a range of topics relating to exercise for CKP were identified by this systematic review. Four studies reported explicit attitudes and beliefs and five documented implied attitudes and beliefs of GPs. Of those explicitly investigating attitudes and beliefs of GPs, attitudes about exercise were established through a) physician interview (n=1), from which attitudes regarding safety and efficacy were reported, sometimes in the context of comparing exercise with other treatment approaches (e.g. pharmacological treatment approaches) (232); b) physician questionnaire (n=2), which investigated attitudes about treatment recommendations for knee OA (165) and their extent of agreement with these (237); and, c) patient and physician focus groups (n=1), through which agreement with recommendations, potential barriers to undertaking exercise as well as uncertainties about exercise were explored (104). The four studies reporting implied attitudes using physician questionnaires (with or without interviews) reported estimates of use of bed-rest (241), rest (235,242) or never/rare use of physiotherapy (178). The remaining study, which obtained data through patient interview, reported a range of attitudes and beliefs of GPs from implied positive attitudes, where patients had been advised to exercise, to implied negative attitudes, from patients who had been advised against exercise (98). From this summary it is clear that a range of attitudes and beliefs were identified within and between studies. This heterogeneity in both methods and results meant it was not possible to draw a clear conclusion about the '*general*' or '*predominant*' attitudes and beliefs of GPs towards exercise for CKP. However, it did highlight attitudes and beliefs that may hinder

implementation of exercise recommendations in clinical practice due to concerns about the effectiveness (232) and safety (98) of exercise for CKP, acceptability to patients of exercise advice (104) and GPs' capacity and/or expertise to initiate this management approach (104). These issues are all represented by elements of the underpinning model for this PhD. More comprehensive, investigation of GPs' explicit attitudes and beliefs about the utility and implementation of exercise for CKP in relation to a specific patient case was therefore necessary to provide an enhanced understanding with less room for ambiguity or assumption.

Variation in the design of included studies resulted in differences in the estimates of behaviours regarding provision of exercise advice, exercise initiation and referral to other practitioners such as physiotherapists for exercise prescription. For example, estimates obtained through physician self-report were generally greater than those generated from actual behaviours. However, it was not only the overall frequency of use of exercise that differed but also the pattern of use of different exercise approaches between estimates of actual versus reported behaviour. In studies examining actual behaviour there was a slightly higher referral rate to physiotherapy than GP provision of advice to exercise, compared with reported behaviours. This may be explained, at least in part, by uncertainty of GPs about the optimum exercises to advise/prescribe or from time restrictions in GP-patient consultations. Logistically and methodologically there is no perfect way of ethically identifying exactly what GPs do in everyday practice with their patients with CKP. However, the variation in behaviours noted in this review, according to which designs were used to elicit clinical behaviour data, heeds a warning about potential for over-estimation when using designs that rely on reported behaviours.

Methodological aspects such as the way in which questions were phrased also generated different estimates of physicians' behaviour. A study that asked about

'*ever use*' of exercise resulted in 99% of GPs reporting they had ever provided advice or referred a CKP patient to a physiotherapist (180), but the frequency of actual provision of exercise advice (4-52%) or physiotherapy referral (3-63%) was much lower. This is unsurprising as it is unlikely that GPs would '*never*' advise any patient with CKP to exercise. Therefore a more clinically relevant way of investigating behaviour really relates to the specific details about use of exercise in the patient management plan. Case-based studies or observations of actual clinical practice would generate the latter, more clinically relevant, data and were felt to be the most appropriate options to consider for data collection during the empirical work in the later stages of this PhD.

3.4.1.2 Consistency within and between studies: definitions of terms

Inconsistencies and/or ambiguities in methodology, definitions, attitudes, beliefs and behaviours in the studies in this systematic review both hindered direct comparison of results and may partly explain the variability observed. To be included in the systematic review, studies were required to include information about CKP; however definitions of this condition used within the primary study were not always given and, where given, were not consistent. This left open the possibility that when interpreting studies reporting behaviours of GPs some may have been suggesting the correct management for the '*wrong*' diagnosis or the wrong management for the '*correct*' diagnosis. This could have been mitigated by requesting GPs to state their working diagnosis. Therefore this was planned for the future research as part of this PhD programme.

Studies investigating attitudes and beliefs of GPs towards exercise for CKP used undefined, non-specific terms to describe the actions of GPs. Terms used included vague descriptors such as '*suggest*' and '*recommend*'. Only one study (98)

acknowledged that the GP management spectrum for CKP may extend from advice to exercise through to specific exercise prescription. Among the studies included in this review, terminology used to describe GPs' behaviours included '*provide*', '*prescribe*', '*recommend*', '*instruct*' and '*advise*', however these terms were not defined and were sometimes used interchangeably (248). This is an issue, not only for determining what GPs are doing but also in defining their role. Thus, during the empirical work undertaken in later stages of this PhD, it was felt important to place greater focus on establishing exactly what GPs do when initiating exercise for a patient with CKP.

The term '*exercise*' was rarely defined or explained in the included studies within the review, thus it could not be determined if '*exercise*' referred to increasing overall activity, general aerobic exercise, specific quadriceps strengthening exercises, range-of-movement exercises or any or all of these. Providing a clear definition of terms was therefore felt important in the later studies described within this PhD.

Recommending '*rest*' (235,258) was interpreted as a negative attitude towards exercise, but again, the term rest was rarely explained in any detail. For example, included studies indicated types of '*rest*' as being anything from bed rest (241) to avoiding exercise (98). Thus, when investigating this topic in the empirical work described later in this thesis, key terms such as '*rest*' were differentiated from '*bed rest*'.

3.4.1.3 Impact of the inclusion of implied attitudes and beliefs

Inclusion of studies in this review that reported implied attitudes and beliefs about the use of exercise, rather than only studies reporting explicit attitudes and beliefs, risked inappropriate assumptions and interpretations. For example, extracted data containing the suggestion of bed-rest or rest was interpreted as an implied '*negative*

attitude or belief' about (the appropriateness, efficacy and/or utility of) exercise for CKP, however, as detailed by the underpinning model (Chapter 2), behaviours are not influenced by attitudes alone. Further, the interpretation of the terms '*exercise*' and '*rest*' may have been different for the authors of the primary study and its participants. A physician may advise '*rest*' from usual physical activities if these are of unusually high intensity or knee straining but in doing so may not be advising complete rest of the knee. However, this latter point would not explain all cases in which '*rest*' is advised; one study reported the proportion of patients provided with '*joint sparing advice*' as decreasing as the rates of advice for '*strict bed rest*' increased (241). Explicit, comprehensive and concurrent investigation of attitudes and beliefs with behaviours, informed by the underpinning model, was undertaken in the later stages of this PhD to establish attitudes and beliefs more accurately.

3.4.1.4 Quality of the evidence available to date

Two quality assessment tools were used to assess each study and both provided similar results. Generally studies included in this review were clear about the research question, study type, outcome factors and sampling frame. However, many studies failed to report whether ethical approval was gained, failed to discuss potential confounding factors, had low response rates (43% studies had less than 50% response) and utilised specialist or geographically limited samples of GPs. The resulting data are therefore likely to over-estimate the actual use of exercise among the wider GP population and may be biased by local service anomalies rather than national system-wide issues. Therefore, for the empirical work undertaken later in this PhD it was felt to be important to use a nationally generalisable sample of GPs and to search for effective techniques to maximise response.

3.4.2 Potential explanations for the observed results

Setting aside the methodological limitations and lack of specificity in definitions among the included studies, other factors may cause true variation in attitudes, beliefs and behaviours among GPs regarding the use of exercise to manage CKP. While reasons for apparent under-use of exercise by GPs were not systematically investigated by any of the studies identified, potential reasons for the apparent under-use of exercise by GPs were suggested by some authors. Potential barriers highlighted by included studies could be linked to elements of the underpinning model (Chapter 2), for example: beliefs about consequences (e.g. lack of awareness of best practice guidelines (165)); uncertainty about the role of GPs in relation to exercise for CKP (104,210,259); and beliefs about capabilities which included GP-related (e.g. uncertainty about appropriate types (179) of exercise and the correct exercise 'prescription' (43,210)), patient-related (e.g. belief that patients will not exercise (216), the presence of comorbidities (259) and increasing patient age (210,259)) and service-related factors (e.g. limited access to services (207)). To best equip and organise professionals and services to deliver evidence-based care for patients with CKP, barriers to initiating exercise need to be identified and solutions that reduce key barriers need to be established. Therefore in the later empirical work within this PhD, the underpinning model (Chapter 2) was used to direct a comprehensive investigation of potential barriers.

3.4.3 Comparing the results observed with data from excluded studies

Individual studies investigating attitudes, beliefs and behaviours of GPs regarding exercise for CKP which could not be included in this systematic review due to uncertainty about which joint (knee or hip) or HCP (GP or other primary care healthcare provider) all the information related to were defined as 'near misses' and

are summarised in Appendix 3. Within these excluded studies the proportions of patients being recommended to exercise or referred to physiotherapy were very similar to those reported by studies included in the review. For example, advice to exercise was given by GPs, or had been received by patients, 18-89% of the time (85,155,167,258,260-264), 40% of GPs reported exercise was an option in the care of patients with OA most of the time (265), 61% of patients referred to orthopaedics had undertaken exercise prior to the referral (119) and 34-73% of patients with OA had tried exercise (85,266). One study did not separate out exercise advice from the core management approaches, and found that, depending on how strict a definition was used, between 17-74% of patients received treatment including exercise (267). Similarly, between a fifth and two thirds of patients had previously attended a physiotherapist (54,106,119,268-272), between 5-31% patients seeing GPs were referred to physiotherapy (155,167,273) and, from a qualitative study of 22 community-dwelling adults with knee pain, only 8% had used NHS physiotherapy in the previous 12 months (100). In one study of patients with hip and knee OA, 25% GPs prescribed 'bed relief' (261). These studies, which did not quite meet inclusion criteria for this systematic review, drew similar conclusions to those from this systematic review and provide further evidence to support the conclusion that exercise appears to be underused in GP management plans for patients with CKP.

3.4.4 Strengths and limitations of the systematic review

Methodologically this systematic review has several key strengths. The key processes of a systematic review, outlined by the Cochrane Collaboration (226) were followed. This review did not restrict searches on the basis of language and two papers were translated into English. In order to minimise the impact of publication bias, unpublished supplementary information was sought from the authors of included studies where needed and, to mitigate against the risk of missed

studies (CRD report this could be up to 8%), an over-inclusive approach for identifying potentially relevant papers for full text review was used (222). To minimise bias and error, three people were involved in undertaking data extraction and quality assessment (222). Although disagreements between researchers were relatively infrequent (for quality assessment only 5% decisions were different between two reviewers), this was valuable as subtle nuances in language were sometimes detected by one reviewer and not the other during data extraction. For example, authors of papers used terms such as '*prescribe*' more casually than the stricter definition used in this work.

The key limitation of this systematic review is the paucity of studies directly examining the attitudes, beliefs or behaviours of GPs in this context and the heterogeneity of the studies found. Usually the elements of the published studies relating to this review comprised only a very small portion of the data reported. This indicates that the review topic is relatively under-researched. Whereas systematic reviews can be used to pool the quantitative results of individual studies together and therefore reach more precise conclusions, this was not possible in the current review due to study heterogeneity. Therefore the findings of the attitudes, beliefs and behaviours of GPs are presented in narrative form only. Although, in general, this review was methodologically strong, it fell short of a few recommendations of '*ideal*' practice (222). Although authors were contacted for more information, as required, and reference lists and related citations were searched for included papers, the search strategy did not include searches specifically designed to capture '*grey literature*' or other wider sources of information (222). However, significant publication bias seems unlikely given the variability in the findings and the fact that considering the two papers with the least bias reported behaviours in the middle of the range reported by all the studies included (see Section 3.3.4).

3.5 Conclusions and implications for the next stage of this PhD

This systematic review has highlighted relatively few, and heterogeneous, published studies that have specifically investigated attitudes, beliefs and behaviours of GPs regarding exercise for CKP. Only one study explicitly used a theoretical model (the TPB) to inform its design, nine others referred to elements of the underpinning model for this PhD (see Chapter 2) and the remaining studies did not describe their theoretical basis. Results indicate that the attitudes and beliefs of GPs regarding exercise for CKP are variable, that exercise for CKP appears to be underused by GPs and its implementation as a core and recommended management strategy for this patient population in GP clinical practice is unclear.

This review has highlighted that previous studies do not always include clear definitions of exercise or CKP, have investigated behaviours that are sometimes of questionable clinical relevance, have failed to examine the association between attitudes and beliefs and behaviours and risk response bias (through low response rates) and selection bias (due to use of samples taken from specialist groups or geographically limited areas). These issues were considered during the development of the subsequent empirical work within this PhD, a national cross-sectional questionnaire survey of UK GPs. To investigate the attitudes, beliefs and behaviours of GPs regarding exercise for CKP and to address the identified knowledge gaps in a more focused and structured way it was necessary to:

- Concurrently investigate attitudes, beliefs and behaviours of GPs about CKP and, specifically, about the use of exercise for CKP using the underpinning model as a foundation for this enquiry
- Investigate behaviour using case- or vignette-based studies or observed behaviours

- Use explicit attitude statements to ensure that actual rather than implied attitudes are assessed
- Establish perceptions of GPs about their role in initiating exercise for CKP
- Identify barriers to, and factors associated with, the use of exercise for CKP

Recognising that GP surveys commonly have low response rates and are therefore at risk of response bias, subsequent work also needed to include strategies to improve GP response. The following chapters describe how the pilot and main surveys were designed (Chapter 4) and subsequently undertaken (Chapters 5 and 6).

4 Designing the pilot survey

The systematic review reported in Chapter 3 identified a need for future research to concurrently investigate the attitudes, beliefs and behaviours regarding exercise for CKP among a nationally generalisable sample of GPs with a clear definition of the condition. To investigate this in a systematic and clinically relevant way it was felt necessary to:

- Contextualise responses in terms of managing a specific patient
- Clarify the perceived and expected roles of GPs with respect to exercise for CKP
- Develop a survey tool to systematically and directly investigate the attitudes, beliefs and behaviours of GPs regarding exercise for CKP

This chapter describes how this objective was met, the decisions made when selecting the survey methodology and the subsequent processes involved in developing the survey tool, pretesting the vignette and pre-piloting the survey tool prior to undertaking national pilot study which is described in Chapter 5.

4.1 Selecting study methods

4.1.1 Selecting a survey as the most appropriate method

Given the lack of a single perfect methodology for investigating clinical behaviours (274), a quantitative cross-sectional survey design was chosen to specifically investigate the attitudes, beliefs and behaviours of GPs regarding the management of, and specifically the use of exercise for, CKP, in a clinically relevant and generalisable way. This quantitative, cross-sectional methodology was deemed

suitable to meet the aim of providing a concurrent description of the attitudes, beliefs and reported behaviours of a large, generalisable, national sample of GPs, at a single time-point. Having this breadth of information from a representative sample of UK GPs was felt to increase the potential external validity of the findings and therefore be suitable to use in making recommendations for future delivery of care in the context of the UK NHS. However, this breadth of information obtained is at the expense of some depth compared with the more open dialogue that is possible during interviews or focus groups (275). This compromise was felt to be acceptable as to obtain a broad range of views and to be able to gain an insight into overall patterns of attitudes, beliefs and behaviours of GPs, a large sample was desirable to describe patterns of attitudes, beliefs and behaviours across a wide population and to enable testing of associations within the underpinning model. Interview, focus group or observational research (e.g. real or simulated consultations) are impractical in this context as, per participant, these are much more time and resource intensive (275,276), which in turn would have increased the time period for data collection.

Use of a self-complete, postal, questionnaire survey as the key methodology allowed GPs to participate in the research at a time and place most suited to them (275) and did not necessarily '*intrude into the professional practice setting*' (277). It has the added benefit of not requiring GPs to review patient records prior to completion.

Because questionnaire surveys can only collect data on reported behaviour (i.e. what GPs say that they do for a specific patient case or vignette), and GPs are aware that their behaviour is being scrutinised, this method is vulnerable to social desirability bias, i.e. GPs reporting what they know they should do, rather than what

they actually do in order to '*please*' the researcher or to be viewed as a competent HCP (277-279). Although social desirability bias has been suggested to be less of an issue for postal questionnaires than face-to-face data collection methods (279), other methodologies were considered in order to try to collect data on actual behaviour while limiting the likelihood of social desirability bias. Such methodologies included medical record review (also known as '*chart abstraction*') and patient report. The advantage of record review is that it provides information on what GPs record they have actually done in real life with real patients. However, this method of data collection can be time consuming (277) and relies on appropriate coding and recording of consultations in medical records, which are known to be often incomplete (277,280,281). Indeed, Jinks et al specifically highlight the lack of routine coding in GP medical records of exercise advice for patients with CKP (236). Therefore, use of medical record review for the purposes of this study may have resulted in an underestimate of actual behaviours and insufficient information, for example, about the detail of the ways in which GPs initiate exercise for patients with CKP. When using record review, the stimulus for behaviour (i.e. the patient presenting) is different on each occasion and the exact nature of the presenting problem and comorbid issues may not be clearly recorded. Compared with using a questionnaire survey, this can make comparing behaviours between GPs or cases challenging. Gathering data about the clinical practice of GPs from patient report provides data on the patient's recall and perception of the GP's behaviour, as patients recall the advice and information they have been given. However, inherent with patient report is recall bias, that is, patients will not consistently or accurately remember everything that they have been told, thus risking inaccurate estimates of GP behaviours (282,283). Finally, observational research such as overt or covert

observation of GP-patient consultations using either real or simulated patients to provide data on GPs' actual behaviour in a real-life setting was considered. However, such approaches are vulnerable to reactivity (284), a type of social desirability bias, unless the GP is unaware they are being assessed which, in itself, raises ethical and logistical issues (277), and data are time-consuming to collect and analyse (274). Observed consultations are particularly useful if the primary focus is on communication and/or examination skills (277), which is not the primary focus of this study. This method of data collection was therefore considered too resource intensive for this thesis, particularly as it also makes large sample sizes impractical and it raises significant ethical issues arising from intrusion into an actual patient-GP consultation. On balance the questionnaire survey method was considered the most appropriate to address the overall aim of this thesis.

4.1.2 Survey delivery method

Choices considered for survey delivery included postal, telephone, email and web-based options. To inform the decision about the most appropriate way to deliver the questionnaire survey, the published literature (285-295) was considered along with information provided from Binley's; a company that provides UK GP contact details. Binley's was identified as a source of GP contact details following experience from another study undertaken in the Research Institute of Primary Care and Health Sciences (RIPCHS) (296), the academic centre within which this PhD was undertaken. This study investigated GPs' (and physiotherapists') attitudes and behaviours regarding LBP using a questionnaire survey and did not report significant numbers of ineligible GPs included in the sample (reported response is 22% which equates to the 423 GPs responding from the 2000 sampled) (296). The

advantages and disadvantages of each delivery method are summarised in Table 4-1. After balancing issues such as time and financial resource, availability of access to the desired population and response obtained from the different delivery methods, the postal method of conducting the questionnaire survey was selected.

Table 4-1 Advantages and disadvantages of different survey delivery methods

	Postal	Telephone	Web-based options	Email
Advantages	Physical presence of documents may prompt response and makes discarding survey more difficult than electronic methods. No specific technical ability required to complete it. Response better than web-based methods. Cheaper than using telephone. Not influenced by interviewer characteristics/rapport. Non-responders can be quantified and sent reminders. Responses can be returned at the participants' convenience.	Clarification of questions at the time of answering possible. Response better than web-based methods. Improved identification of ineligible participants. Participants appreciate personal approach. Less affected by length, once respondents start they are less likely to stop before it is complete. Non responders can be quantified.	Cost of online survey may be less than mailings for larger sample. Can set up items to only allow responses desired (e.g. one answer per question) or to prevent submission without completion of items. Responses automatically coded. Can randomise order of questions if concern that question order may influence responses. Not influenced by interviewer characteristics/rapport. Responses can be returned at the participants' convenience.	(see also web-based options) Very low cost of mailings. Non-responders can be quantified and sent reminders. Responses can be returned at the participants' convenience.
Disadvantages	Response less than using telephone. Hard to make 'boring questions' less so. Stationery, postage and personnel costs can be high for larger samples.	Time and/or resource intensive. Multiple contacts may be required to achieve response. Can be influenced by interviewer characteristics. Mutually convenient time required for researcher and responder.	May require specialist expertise to set up. Depending upon how the survey is advertised the denominator may be unknown, thus making estimation of impact of response bias impossible.	High cost of obtaining email details of study sample compared with postal details.* Email database less extensive than address database.* Response no better, if not worse, than postal-surveys.

* Personal correspondence with Binley's database representative. Taken from Sibbald et al (1994) (285), Templeton et al (1997) (286), Kaner et al (1998) (287), Schleyer & Forrest (2000) (288), Kaplowitz et al (2004) (289), Hocking et al (2006) (290), VanGeest et al (2007) (291), Beebe et al (2007) (292), Grava-Gubins & Scott (2008) (293), de Vaus (2014) (294), Survey Monkey (2015) (295)

4.2 Developing the survey tool

Development of the survey questionnaire was informed by the underpinning model (Chapter 2). This framework outlined the role that beliefs about consequences of a behaviour, social influences and moral norms, role and identity, personal characteristics, beliefs about capabilities and habit/past behaviour have on intention to undertake a particular behaviour and subsequently undertaking that particular behaviour (131,133-135). The questionnaire therefore needed to seek information on GPs' behaviours (i.e. whether or not they use exercise) and their associated attitudes and beliefs, such as beliefs about the consequences of exercises, beliefs about their role in initiating exercise with these patients, beliefs about their capabilities and their awareness and adoption of guidelines.

4.2.1 Investigating behaviours using a survey tool

The primary aim of this PhD was to investigate GPs' attitudes, beliefs and behaviours regarding exercise for patients with CKP. When using a self-administered survey tool, data obtained pertains to reported behaviours, i.e. the GPs report what they think they do. Reported behaviours can be gathered using general questions, for example '*Do you use exercise in the management of CKP?*' or contextualised using a patient case or vignette. A clinical vignette is a written case scenario (297) of a fictitious patient, based on a realistic clinical situation (277), that is presented to HCPs. Accompanying questions are used to examine behaviour or performance of the individuals being investigated (277,298). Vignettes contextualise the behaviour being investigated, which potentially improves the accuracy of responses (131), when compared with less anchored, more theoretical, questions. Because a consistent stimulus is given to each participant (277,297-299), between

participant comparisons can be made as, in contrast with observation of real clinical encounters, confounders are minimised (277,298).

Vignettes have been validated as a useful measure of clinical practice, behaviour and/or performance (297,299,300). They compare favourably with record review, as the information about what clinicians actually do appears more complete (300). However, vignettes do not appear to capture exactly the same information when compared with the scoring of clinician behaviours by an unannounced standardised patient (i.e. clinician is unaware that the patient is not genuine) directly after they have consulted (300), a method considered as the gold standard (274). Given that the use of unannounced standardised patients is impractical in the context of a large national study and the differences between standardised patient scores and vignette scores in a validation study was small (300), vignette-based questions were chosen to assess GPs' reported behaviours in this survey.

4.2.2 Previous relevant survey tools: The ABC-Knee survey tool

It is desirable to consider existing tools when undertaking questionnaire surveys, particularly as items may have already been tested for face validity among a professional group and comparison of the new results with those previously obtained is possible (301,302). Therefore, the development of the survey tool for this research was informed by the physiotherapist survey tool used within the ABC-Knee study, designed to investigate the attitudes, beliefs and behaviours of both older adults with CKP and physiotherapists about exercise (99,174,303). Basing the survey tool for this thesis on the ABC-Knee survey tool used among physiotherapists was desirable in order to facilitate comparison of GP responses with those previously obtained from physiotherapists, which could therefore provide

context, for example, with regards to social norms, and identify areas of concordance and discordance between the two professional groups. Components of the ABC-Knee survey tool that were retained for use within the current questionnaire survey are described below.

To investigate attitudes and beliefs about the use of exercise for CKP (i.e. beliefs about consequences in the underpinning model), Holden and colleagues (175) created 23 attitude statements from the ten MOVE consensus recommendations for the management of lower limb OA (see Section 1.2.2.1) (50). These statements were valuable for identifying specific attitudes relating to individual concepts relating to exercise use for CKP which are included in the MOVE consensus recommendations and subsequent evidence-based guidelines. The attitude statements relating to each of these recommendations, and the way in which they were adapted for use in the current pilot survey tool are summarised in Appendix 4.

Attitudes about causality of CKP, which may influence beliefs about consequences of using exercise, were investigated in the ABC-Knee study using attitude statements (and associated Likert scales) relating to possible risk factors. These items had also previously been used in another study led by members of staff within the RIPCHS, the Acupuncture, Physiotherapy and Exercise (APEX) randomised controlled trial investigating the clinical effectiveness of acupuncture and exercise for CKP (304). Possible causative factors contained within these attitude statements were those that empirical evidence suggests are associated with CKP and are highlighted by the NICE guidelines (2), such as: genetic predisposition (305), being overweight/obese (28,305), a person's own mental attitude and/or mental state (306), increasing age (28), previous accident or injury (28) and radiographic

changes; while radiographic changes do not consistently correlate with symptoms and functional limitations, this is more likely the worse the radiographic changes are (2,37).

The 19 item Pain Attitudes and Beliefs Scale for Physiotherapists (PABS_PT) (307) scale was used by Holden et al, to assess attitudes and beliefs of physiotherapists about CKP in general. As hypothesised by the underpinning model (Chapter 2), beliefs about the consequences of using exercise may impact one's use of exercise. As a way of investigating attitudes about pain and, related to this, the '*danger*' conveyed by undertaking exercise, the PABS_PT may identify factors associated with GPs' beliefs about consequences of using exercise for patients with CKP. The use of PABS_PT among GPs in relation to CKP will thus now be discussed in more detail, before continuing to describe the development of the survey tool.

4.2.3 Investigating HCPs' attitudes and beliefs about musculoskeletal pain: the PABS_PT tool

GPs' attitudes about the nature of CKP (see Section 2.6.1.1) may impact their behaviours with regards to the management they recommend. The measurement of attitudes and beliefs about pain is complex and a number of tools have been developed, most often in the context of chronic low back pain (LBP). There is little directly relevant literature examining this concept in CKP. A systematic review of the tools that have been developed to identify HCPs' attitudes and beliefs about LBP identified that, although none were perfect, the Pain Attitudes and Beliefs PABS_PT (164) demonstrated some validity (308). Subsequent unpublished work at the RIPCHS has revealed the PABS_PT to cover the broadest range of constructs when compared with other similar attitudinal measurement scales (309). The PABS_PT

was developed to identify physiotherapists' attitudes and beliefs about LBP and to assess the association of these attitudes and beliefs with their subsequent clinical management (164,307). Responses to PABS_PT items are divided to form two different treatment orientation subscales: 1) biomedical and 2) behavioural. Items within the biomedical subscale relate to pain being an indicator of (impending) physical damage, whereas items on the behavioural subscale are based on the biopsychosocial model of care that shifts the focus away from underlying tissue damage and towards a more holistic view of the experience of pain, including psychosocial factors. A high score on the biomedical subscale has been shown to be associated with HCPs viewing daily activities as harmful for LBP and to provide advice to reduce work activities (307). Although evidence suggests reasonable internal consistency of the PABS_PT overall, compared with the biomedical subscale, the behavioural subscale is often found to have reduced internal consistency, explain less variance and reduced reliability in test-retest studies (310). Associations between treatment orientations and, at least reported, behaviours have been identified (308).

Published literature examining GPs' treatment orientations using scales that were precursors to the PABS_PT have examined attitudes and beliefs about LBP and have shown some association with reported behaviour, although no correlation with actual behaviour (311). Published use of an adapted PABS_PT among GPs is also only in the context of LBP and has revealed significant linear relationships between increasing deviation from guideline recommendations for advice about bed rest, activity and work, with higher biomedical scores and lower behavioural scores (296) and acceptable reliability of the scale among this population (312). However, there is no published research examining the use of an adapted PABS_PT among GPs

in the context of CKP. Given that no other relevant validated tool existed with which to measure GPs' attitudes about CKP, and there is some empirical evidence that adapted versions of the PABS_PT can demonstrate expected associations with reported behaviours (296), an adapted version of PABS_PT was included in the survey tool. Adaptation of the PABS_PT for this study included substituting the term 'back pain' with 'chronic knee pain' or 'chronic knee problems', in line with the changes made in the ABC-Knee questionnaire (see Appendix 4 for further detail). The inclusion of the PABS_PT in the survey tool used in this PhD enabled assessment of the value and relevance of an adapted PABS_PT among GPs in the context of CKP.

4.2.4 Developing and pre-testing the vignette

When investigating behaviours using a vignette, the patient presentation depicted by the vignette must be appropriate to the skills, experience and working environment of the group being investigated. The ABC-Knee survey used a vignette and associated questions to investigate the reported behaviour of physiotherapists managing a patient with CKP (174). However, the vignette and associated questions were not appropriate for use in a GP survey. The vignette detailed a patient on an unconventional medication regimen and who had already been referred to physiotherapy. These factors were not thought to reflect a typical patient's first consultation for CKP with a GP. The vignette-based questions in the ABC-Knee survey did not focus on some of the important aspects of a GP consultation, such as the need to make a diagnosis, consideration of investigations or the use of pharmacological treatment strategies. Therefore a vignette more relevant to a GP

consultation, and associated questions about practice behaviour, were developed for the purposes of the current survey.

To guide the structure of the vignette for this survey, eight existing vignettes used in published literature were examined to identify the usual presentation, length and content. Sources of vignettes examined were i) full text papers identified within the systematic review (242,243,313), ii) studies investigating the management of LBP (296,314) and iii) the ABC-Knee study (174). The information in the vignettes was ordered in the format of a typical medical history: patient demographics, presenting complaint, history of presenting complaint, comorbidities, relevant psychosocial issues, examination findings and investigation findings, where this information was given. All vignettes contained information on the patient's age, gender, presenting symptoms, duration of symptoms and examination findings, most contained information on occupation (n=7), imaging results (n=5) and presence/absence of trauma (n=5) and half included information on the presence/absence of comorbidities and management strategies to date. Two vignettes also included details of the patient's hobbies, laboratory results and weight, and one detailed the patient's ethnicity.

Vignettes must be as realistic as possible (277,315). To ensure the vignette depicted an authentic primary care patient presentation, four vignettes, each based on a real patient, as recommended by Bachmann et al (316), were drafted and pre-tested (277). Real patient data from the APEX trial (304), introduced above, informed the vignettes. These data were particularly helpful as they provided good depth of information on patients' knee pain, stiffness, function and demographics. Patients in the trial were well characterised in terms of their physical function using the Western

Ontario and McMaster universities osteoarthritis (WOMAC) index (317), a scale with 24 items divided into three subscales (pain, stiffness and physical function) (318) (the higher the score in each subscale the greater the problems experienced by the patient). The physical function subscale has 17 items with each item scored using a five-point Likert scale, from zero (no problems) to four (extreme difficulty), giving a possible range of scores from 0-68 (317). From the patients included in the APEX study, thirty were randomly selected, ten each with WOMAC physical function scores of 20, 30 and 40 to identify mild, moderate and severe functional limitations, respectively. The average year of birth, BMI, comorbidities, medications, job satisfaction and the most common marital status of the patients within each functional category (mild, moderate and severe functional limitations) were identified. A summary of the characteristics of real patients with CKP used to inform the vignettes is provided in Table 4-2. The four vignettes (presented in Appendix 5) were drafted using the characteristics of the most typical real patient in each of the functional categories and for one patient with comorbidities (who had a WOMAC physical function score of 30). Missing/inappropriate information was added/substituted using clinical experience of the author of this thesis (e.g. to develop phrases to describe pain), published information (e.g. to include realistic risk factors for, and presenting symptoms of, CKP) and using published qualitative patient statements (19).

Table 4-2 Summary of characteristics of real patients with CKP used to inform the vignettes

Characteristic	WOMAC Score 20 (n=10)	WOMAC Score 30 (n=10)	WOMAC Score 40 (n=10)
Year of birth	1940	1942	1938
BMI	29	30	28
Number of comorbidities	1.8	1.0	1.7
Number of medications	2.0	2.1	3.4
Marital status	All married	Most married	Most widowed or divorced

BMI = body mass index, WOMAC = Western Ontario and McMaster universities osteoarthritis index

Information provided within a vignette should be sufficient to allow management decisions to be made, brief enough to allow respondents some room to express variability in their behaviours (277,319) and should avoid misleading the reader or producing unintentional ambiguity (277). Therefore pre-testing of the four vignettes was undertaken by GPs who had attended a continuing professional development (CPD) meeting (277). The vignettes were presented in written format in no particular order without highlighting the differences between them. GPs were asked to provide written feedback on realism, ambiguity, ease with which an informed clinical decision could be made based on the information provided, presence of surplus information and any other areas in which they felt changes were necessary (277). Finally, GPs were asked which vignette most clearly represented the majority of patients with CKP that they see in their clinical consultations. Although only six of the eight GPs provided written feedback about the vignettes, all eight GPs participated in a group discussion about the vignettes after written responses were completed. The feedback included suggestions to shorten the vignettes, simplify examination findings, align the information on pain assessment with methods used by GPs, remove features that may suggest inflammatory arthritides, add detail about

BMI rather than actual weight, add previous management strategies and reorganising the presentation of the vignette so that the layout reflected that used in computerised medical records (see Appendix 5 for a summary of the GP feedback about the vignettes). GPs commented that they felt a '*typical CKP patient*' tends to be female and younger than those seen in the draft vignettes. The GPs perceived that CKP in younger patients (i.e. in their 50s) more significantly limits their lifestyle and that patients often presented with an acute-on-chronic problem, triggered by increasing pain or functional problems. Therefore a specific trigger for consultation with the GP was suggested, for example, low mood due to functional limitations, exacerbation of symptoms due to cold weather or recent increase in activity, or that the patient wants help to improve their symptoms before they go on holiday. Despite the feedback from the GPs, it was felt to be important when finalising the vignette, to avoid triggers to consultation such as low mood and/or an impending holiday, which may distract GPs from the management of CKP or may promote a more temporary, '*quick fix*', pain relief strategy. GPs commented that patients with CKP often consult with more than one problem. Although this was noted, for the sake of simplicity, brevity and ability to interpret the results generated from the vignette-based questions, the vignettes were not amended to add other health problems. A suggestion for more information on test results was not actioned as the use of investigations was going to be examined within the survey (see Section 4.2.5.3).

Using feedback from GPs, the one thought to be most clinically relevant was selected. The GPs agreed that the most representative vignette of a '*typical*' presentation in general practice was the patient with milder problems (a WOMAC physical function score of 20). This was consistent with the mean WOMAC physical function score of 23 identified in a survey of adults with CKP aged 50 years or above

in North Staffordshire (122). In light of all the feedback, the vignette was amended as follows to create the final version: it was shortened from 218 words to 109 words, the patient's age was reduced, the gender changed to female, the history and examination information was simplified, information on comorbidities was removed, a specific trigger for consultation was added, the pain was described in terms of functional impact rather than a score and the patient's BMI was added. Box 4-1 presents the final vignette that was subsequently used in the pre-pilot questionnaire (see Section 4.3).

Box 4-1: Patient vignette used in the pre-pilot questionnaire

Patient:	Mrs Jones, 58-year-old Prison Officer
History:	First presentation of gradually worsening bilateral knee pain (right worse than left) over 2 years No history of trauma Pain moderate when walking and at rest, worst when climbing stairs. No night pain. Managing activities of daily living. Difficulty gardening. Stopped going to gym – thinks was making pain worse Only treatment tried is ibuprofen once or twice when pain "really bad" – no benefit. Came today finding work increasingly difficult due to the stairs Usually well – no comorbidities
Medication:	Nil
Examination:	Body Mass Index 33 Knees – bilaterally no effusions. Joint tenderness upon palpation. Bilateral coarse crepitations. Slightly reduced flexion of the right knee.

4.2.5 Development of the survey tool

The content of each section of the survey tool will now be described, including the underlying rationale for the choice of items and how the questionnaire items relate to the underpinning model (Appendix 6). The survey tool was pre-piloted (see Section 4.3) prior to finalisation for the UK pilot described in Chapter 5.

4.2.5.1 Section 1: About the GP

The first section of the survey tool was designed to collect data on the demographic and individual characteristics of the participating GPs in order to describe the sample and to permit investigation of the associations between GPs' characteristics and their clinical behaviour (see Section 2.6.4). Key characteristics of GPs hypothesised to be associated with their use of exercise for patients with CKP included their years in practice, the size of their general practice, their previous clinical training and GPs' personal experience of CKP. Table 4-3 summarises the nature of, and rationale for, the demographic data collected in the questionnaire.

Table 4-3 Content of, and rationale for, the collected demographic data

Demographic detail	Hypothesis and sources
Year of qualification	GPs who have most recently qualified may be most up-to-date with current guidelines.
Number of GPs working in the same practice	As GPs refer to colleagues to learn about management strategies, GPs working in small practices may be less familiar with evidence-based recommendations. Further, attitudes towards recommendations for OA among GPs in a solo practice may differ to those who work with others.
Working in an urban, semi-rural or rural practice	Geographical position of practices may influence behaviour due to variations in the ease of access to services.
Gender	Gender may be associated with differences in attitudes and behaviours.
Frequency with which the GP sees patients with CKP	GPs who see patients with CKP more frequently may be more familiar with evidence-based recommendations.
Whether the GP is a GP with special interests (GPwSI) in musculoskeletal disease, rheumatology or orthopaedics	GPwSI may be more likely to recognise the importance of OA however they may also be more likely to undertake more invasive management strategies such as corticosteroid injection.
Undergraduate/postgraduate experience and/or training in relevant rheumatology, orthopaedics or rehabilitation	Those who have specific, relevant experience and/or training may be more likely to practice in an evidence-based way.
Personal experience of CKP	A GP with CKP may be more familiar with appropriate management if they have investigated self-care strategies.

Taken from: Stross et al 1985 (156), Potts et al 1986 (205) Davis et al 1995 (207), Glazier et al 1998 (242), Gabbay et al 2004 (169), Choudhry 2005 (206), Elstad et al 2010 (320), Clarson et al 2013 (168), McKinlay et al 2013 (321), Smink et al 2013 (322),

4.2.5.2 Section 2: Views about chronic knee pain

To investigate beliefs about the consequences of exercise, GPs' beliefs about the nature and significance of CKP needed to be identified as it was hypothesised that GPs may be more likely to include exercise in the management of a patient if they are not fearful of exercise causing further pain or knee damage pain. To enable comparisons between GPs and physiotherapists, the sections included in the ABC-Knee study that investigated beliefs about CKP were used as closely as possible (see Appendix 4). Inclusion of statements enquiring about GPs' beliefs about the causality of CKP was thought to be valuable because: 1) it can illustrate the degree to which respondents' attitudes about causation of CKP align with current understanding from best evidence and 2) the association between beliefs about causation with subsequent behaviour could be assessed. For example, GPs may be more likely to use exercise if they believe CKP is caused by modifiable factors (e.g. being overweight/obese or having weak muscles around the knee) and less likely to recommend exercise if they believe CKP is caused by unmodifiable factors (e.g. genetic predisposition, aging). A further example is that they may be more likely to recommend exercise if they have a high behavioural treatment orientation.

4.2.5.3 Section 3: Clinical scenario of a patient with chronic knee pain

The pre-tested vignette described above was the foundation of the third section of the questionnaire which investigated GPs' behaviours. In line with previous work (297,300), the vignette-based questions were based on evidence-based standards of practice that were applicable at the time (48,50) to enable interpretation of GP behaviours in the context of best practice. Where appropriate, items were similar or identical to those used in the ABC-Knee study (174) to allow for comparison of

responses with physiotherapists. To ensure that behaviours of GPs were interpreted appropriately, GPs were asked to state the diagnosis they would give to the vignette patient. A series of questions asked GPs to comment on the vignette patient's prognosis, severity of symptoms and underlying knee joint damage, the tests and investigations they would want to order and any referrals and treatment plans. GPs who reported using exercise for the vignette patient were asked to complete items enquiring about the exact nature of how they would use exercise. It was hypothesised that GPs may be less likely to use exercise if they thought the patient's underlying knee damage was severe (i.e. a factor that may be perceived to influence efficacy of exercise), if they suggested investigations such as radiography (123) and/or they believed the patient has an inevitably poor prognosis.

4.2.5.4 Section 4: Views about the role of exercise in treating chronic knee pain

To investigate GPs' awareness of best-evidence recommendations, agreement with guideline recommendations, understanding of the risks/safety of exercises and, more generally, behavioural intention, MOVE consensus-derived attitude statements, developed for the ABC-Knee study (175), were included. Items were only changed if they were clearly irrelevant to general practice or to improve clarity; a detailed summary of how the MOVE consensus-derived attitude statements were used is found in Appendix 4. Four new statements were added to assess GPs' views of the causes for any under-use of exercise observed; 1) exercise for CKP is only effectively provided by physiotherapists, 2) time constraints prevent GPs from providing advice on individual exercises for CKP, 3) exercise for CKP should only be used after drug treatment has been tried and 4) exercise for CKP would be used more frequently if access to physiotherapy was easier. These were derived from

potential barriers highlighted by the systematic review (Section 3.4.2) and provided information about the GPs' perceived behavioural control over initiating exercise into the management of patients with CKP. Due to the lack of clarity in published guidelines about the roles of GPs in initiating exercise among patients with CKP, GPs were asked to indicate their perceived role in including exercise in the management of a patient with CKP to facilitate investigation of associations between perceived role and exercise use (see Section 2.6.3).

To avoid overwhelming GPs with a very full page of response options and to enable GPs to express a neutral view, the Likert scale for these items was reduced from a six-point scale used in the ABC-Knee study to a more conventional five-point scale (279). A five-point scale avoids forcing ambivalent responders into selecting a positive or negative response, which can increase the risk of missing data (255). This did not preclude comparison of results from the ABC-Knee study because during analysis Holden and colleagues only concentrated on the two most extreme agree and disagree statements (87,175).

4.2.5.5 Section 5: Awareness of guidelines

According to the underpinning model, to adhere to evidenced-based recommendations, GPs must first be aware of them (134). To investigate the awareness of GPs about guidelines, five real clinical practice guidelines pertaining to CKP were listed and GPs were requested to comment on the extent of their familiarity with them. As it was anticipated that this question may be particularly susceptible to social desirability bias, a fabricated guideline title was also included in order to quantify the extent to which GPs indicated that they were familiar with non-existent guidelines.

4.3 Pre-piloting the survey tool

Novel survey tools should be pre-piloted to ensure they are readable, understandable and do not contain obvious errors or ambiguities (279,301,302). Once drafted, the developed pre-pilot questionnaire (see Appendix 7) was completed by eight GPs working in the RIPCHS. GPs were asked to comment on the time taken for completion, to identify questions that could be omitted, had caused confusion or that may cause offense and/or irritation and to provide any other feedback about the questionnaire. The average reported time for completion was 16 (range 10 to 20) minutes. The vignette was interpreted as intended as respondents gave a diagnosis consistent with CKP (e.g. knee pain, knee OA or '*wear and tear*'). The associated questions were generally well completed and the nature of responses was in line with expectations.

Feedback from the GPs suggested that the PABS_PT and MOVE items were repetitive and/or they found the long lists of attitude statements daunting. Although only 1% of items in Section 2 of the questionnaire (see Section 4.2.5.2) and no items in Section 4 of the questionnaire (see Section 4.2.5.4) were unanswered, 25% and 18% of responses were neither agree nor disagree in these sections, respectively. However, given that scoring of PABS_PT required all items to be included and that comparison with physiotherapist data was desired, no items from these sections were changed.

4.4 The pilot questionnaire

Changes to the survey tool were made as a result of the pre-pilot feedback (see Appendix 8) and subsequent discussions. The most significant of these changes occurred within Sections 2 (see Section 4.2.5.2) and 5 (see Section 4.2.5.5). Items

were added to Section 2 to improve the focus on the attitudes and beliefs of GPs in relation to their interest in and perceived importance of CKP. To do so, questions that had previously be developed to draw upon domains of the TDF (133) in the context of hypertension (153), and were subsequently adapted for use in the context of OA (323), were added to the current survey tool. These items were added to explicitly investigate factors which may impact clinical behaviours such as beliefs about social/professional role and identity (e.g. it is part of a GP's job to manage people with CKP), environmental context and resources (e.g. GPs have enough time to manage patients with CKP) and motivation and goals (e.g. managing patients with CKP is a priority for GPs and managing patients with CKP is of clinical interest to me).

Section 5 was also amended following the pre-pilot as it was thought unlikely that a GP would be aware of a wide range of guidelines, particularly those primarily targeted at more specialist audiences (e.g. EULAR, MOVE and Osteoarthritis Research Society International (OARSI) recommendations). Therefore this section, which investigated the awareness of guidelines, was changed from asking about awareness of a number of guidelines, to enquire more specifically about the GPs' awareness and attitudes about the NICE OA guidelines (48). The NICE OA guidelines were chosen as these were felt to be the point of reference most likely to be used by UK GPs for this topic; i) because GPs are a primary target for NICE guidelines and NICE provide specific educational, reference and quality improvement tools for GPs (324), and ii) because there were NICE guidelines that were specific to CKP. While it was recognised that GPs in Scotland refer to Scottish Intercollegiate Guideline Network (SIGN) guidelines, there were no SIGN guidelines relevant to CKP at the time this PhD was undertaken. GPs' attitudes about NICE

guidelines, relating to agreement with guidelines (included in the underpinning model, see Chapter 2), were investigated using attitude statements that had previously been developed by Porcheret and colleagues (323). These statements, which asked GPs about the credibility, primary target and implementation of NICE guidelines, were based on work undertaken by Heneghan and colleagues which used the awareness-to-adherence model (134) to investigate adherence to hypertension guidelines (153). In an attempt to learn more about social influences and moral norms acting on GPs, their past experiences, to avoid a purely researcher-centred agenda and to increase the breadth and completeness of GPs' views (325), an additional item asking GPs to comment on their experiences of implementing guidelines in the management of CKP was included.

Smaller changes to the survey tool following the pre-pilot included:

- Removal of questions GPs found difficult to answer e.g. frequency with which they see patients with CKP (required estimates which may lack accuracy or may have prompted the GP to undertake time-consuming searches to establish an accurate answer), previous undergraduate and postgraduate '*work*' (high risk of recall error and problems defining work in comparison to clinical placements), '*chance or bad luck*' (non-essential and ambiguous) as '*causes*' of CKP
- Adding information about the type of GP e.g. partner, locum, salaried
- Improving clarity of wording e.g. '*work*' as a cause of CKP was changed to '*manual work*', '*changes seen on x-ray*' was changed to '*changes consistent with osteoarthritis seen on x-ray*', the word '*not*' in a PABS_PT statement was

not removed, as suggested by a GP (see Appendix 8), but underlined, to emphasise the negative and thus reduce the risk of error in reading it

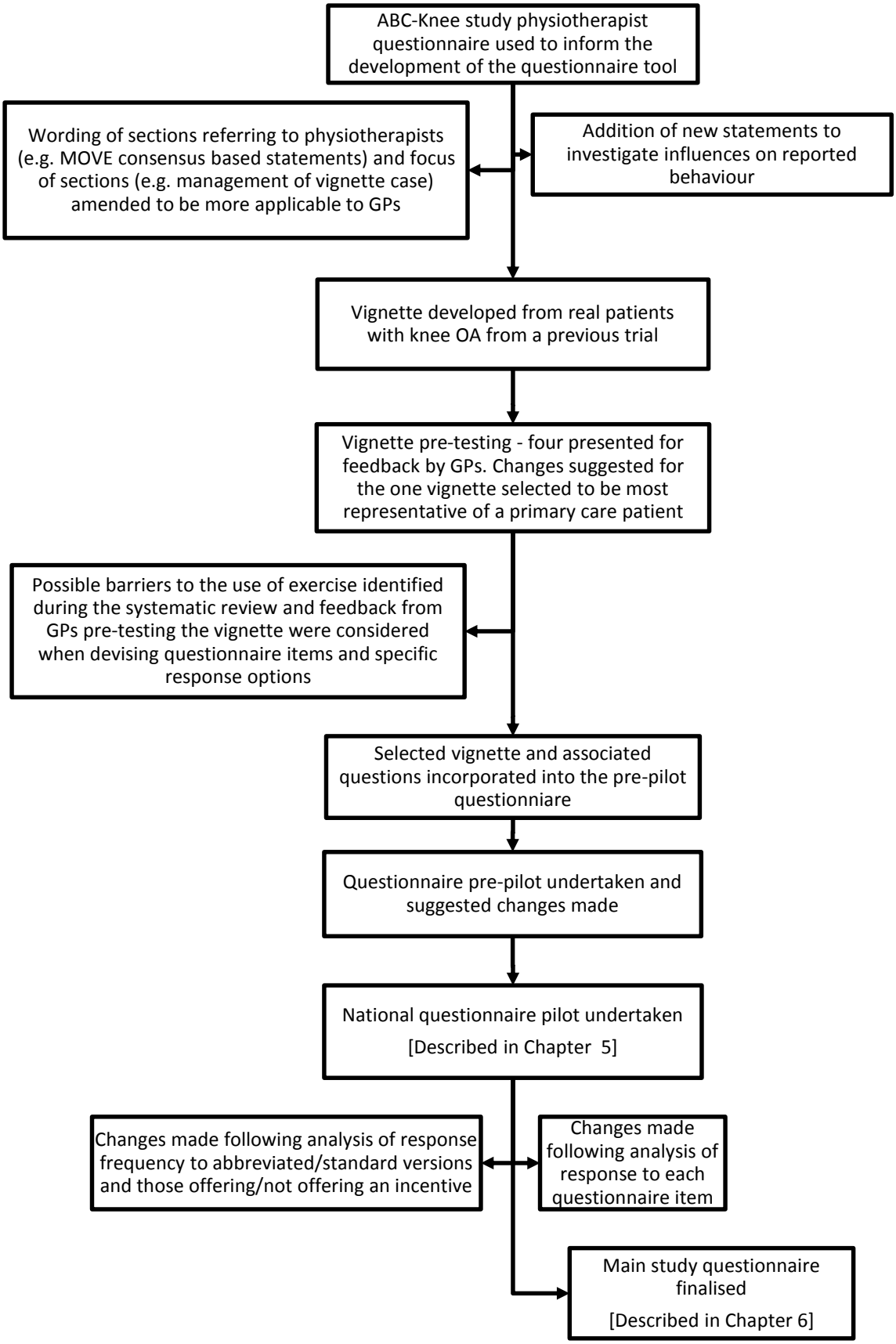
- Amendment of wording for improved brevity and clarity e.g. '*It is the GP's responsibility to make sure the patient will continue doing their exercise programme*' to '*GPs should follow-up patients to monitor extent of continuation of exercises*' (see Appendix 8)
- Changes to the vignette e.g. adding information about hip examination (see Appendix 8, this aligns with clinical examination literature as there is a possibility that knee pain is referred from the hip (326)), and changing '*pain moderate when walking and at rest*' to '*pain always present when walking and at rest*' (to address feedback that highlighted that the wording 'pain moderate' in the vignette may lead GPs to answer that the patient's symptoms are moderate in the associated question (see Appendix 8)). For the final version of vignette that was used in the pilot survey see Box 4-2 (the original version was shown in Box 4.1)
- The addition of boxes on the front of the questionnaire for ineligible recipients to indicate the reason why they are ineligible

This chapter has described the steps involved in developing the survey tool used in the UK pilot survey described in the next chapter, these included; development and pre-testing of a patient vignette and pre-piloting of the original tool. The resulting survey tool used in the national pilot (see Appendix 9) was eight-pages long. Appendix 6 outlines how the pilot questionnaire content mapped on to the behavioural theories informing this research. The next chapter of this thesis describes the pilot survey.

Box 4-2: Vignette used in the pilot survey

Patient:	Mrs Jones, 58-year-old Prison Officer
History:	First presentation of gradually worsening bilateral knee pain (right worse than left) over 2 years No history of trauma Pain always present when walking and at rest, worst when climbing stairs. No night pain. Managing activities of daily living. Difficulty gardening. Stopped going to gym – thinks was making pain worse Only treatment tried is ibuprofen once or twice when pain "really bad" – no benefit. Came today finding work increasingly difficult due to the stairs Usually well – no comorbidities
Medication:	Nil
Examination:	Body Mass Index 33 Knees – bilaterally no effusions. Joint tenderness upon palpation. Bilateral coarse crepitations. Slightly reduced flexion of the right knee. Hips **–** no abnormality detected

Figure 4-1 Flowchart summarising pilot questionnaire development



5 GPs' attitudes, beliefs and behaviours regarding exercise for chronic knee pain: a pilot questionnaire survey

A cross-sectional postal questionnaire survey was selected to investigate the attitudes, beliefs and behaviours of GPs regarding exercise for CKP. To ensure that the optimum methods were used, that the survey tool obtained the required data as specifically as possible, and that adequate data were obtained for the main survey, a pilot questionnaire survey was undertaken as the next stage of this PhD. This chapter describes the aims, methods and results of the pilot survey as well as the implications of the results for the main survey.

5.1 Aims and objectives of pilot survey

The pilot survey was designed to address objective three of this PhD, to investigate the likely response to, and completion of, a questionnaire survey of GPs, and to finalise the survey tool and methods that will maximise the quantity and quality of response to the main survey (described in Chapter 6). The detailed objectives associated with the primary aims are listed in Table 5-1. In addition, the secondary aims of the pilot survey were to gain a preliminary insight into the likely attitudes, beliefs and behaviours of GPs regarding exercise for CKP.

Table 5-1 Aims and objectives of the pilot survey

Aims	Objectives
Collect data to inform the sample size calculation and methods for the main survey	• To describe the proportion of GPs who respond with a completed questionnaire • To establish the appropriateness of Binley's database as a sampling frame (i.e. proportion of recipients who responded stating they were no longer GPs) • To undertake two nested studies to test the effect of 1) questionnaire length and 2) incentives on response • To test the effect of reminder mailings on response • To identify the proportion of GPs who include the use of exercise in the management of the vignette patient
Collect data to refine the survey tool	• To identify the nature and extent of differences in responses given to open questions with free-text response options and closed, multiple-response option questions • To ascertain completion of individual questionnaire items to detect problematic items by identifying those resulting in missing data and/or spurious results (i.e. those that are not in line with the information intended to be collected)

5.2 Methods

The previous chapter described the rationale underlying the decision to use a cross-sectional questionnaire survey method to investigate the attitudes, beliefs and behaviours of GPs regarding exercise for CKP. However, response from GPs to postal questionnaire surveys is notoriously poor (256,327). A review of published GP surveys identified a mean response of 61% (95% CI 59-63%), but showed higher response rates among journals with higher impact factors and a declining response over time (328). GP surveys in the UK often fail to obtain response rates above 50% (296,329,330). Insufficient response undermines the value of studies through response bias which can reduce the generalisability of results obtained (331-333). However, aiming to achieve complete response (a census (334)) may not represent a good compromise between data quality and use of resources, as methods to achieve such high response are often expensive in time and finances

(335) and may represent a significant burden on the target sample. The impact of evidence-based strategies for improving response (257), such as using an abbreviated version of the questionnaire, an incentive and reminder mailings, described below, among GPs is uncertain. Pilot surveys are scaled down versions of a main survey and are designed to test the processes of the main survey (279,336). This section explains how the survey tool was used in the pilot survey and the methods undertaken to address the pilot aims. The content of this chapter has been guided by the STROBE checklist for reporting observational studies (337).

5.2.1 Maximising response

Given the known risk of low response among GPs, it was vital that specific consideration was given to appropriate and feasible methods that could be utilised in an attempt to maximise response from UK GPs. Evidence from studies with a broad range of populations (patient, HCPs, as well as both the general population and non-healthcare professionals) indicates that response to questionnaires can be improved by a number of approaches, summarised in Appendix 10. After considering these approaches, personalised letters (257,291,338), shorter questionnaires (257), incentives (252,257) and reminder mailings (257,339) were selected for use in this pilot survey. Each of these is discussed further below.

5.2.1.1 Personalised letters

There is evidence that survey responses from both physicians and the general population may be improved by using personalised letters (257,291,338). Personalisation may take a number of forms, which include the recipient's name, or the complete letter, being handwritten or the use of printed names on the top of

letters. This latter approach was relatively straight-forward, with letters able to be printed directly from the mailing database. Therefore the impact of personalised letters was not formally tested within this pilot survey as, given the low resource cost of doing this, even a small response increase would represent a net benefit. Thus all GPs in the sample received a personalised letter in the form of printed names on covering letters.

5.2.1.2 Abbreviated questionnaire

Some studies suggest that survey length influences response, with shorter questionnaires tending to yield a better response than longer questionnaires (257,287,291,340,341). However, the impact of survey length specifically among GPs and definitions of '*short*' and '*long*' in this context are unknown. Further, it is important to achieve an appropriate balance between depth and quantity of information obtained versus the burden to participating GPs. Therefore, in order to establish the optimum balance, an abbreviated questionnaire (AbQ, Appendix 11), which was half the number of pages of the original standard questionnaire (StQ, Appendix 9), was created by removing some of the demographic information, the adapted PABS_PT tool and attitude statements relating to the cause of CKP. Comparison of the response to the two questionnaires could then inform the length of the main questionnaire survey tool. The AbQ was four pages long and, from testing on local colleagues it was established it took 10 minutes to complete, compared to the eight-page StQ which, in line with the pre-pilot version, took 15 minutes to complete. For further details of similarities and differences between the two questionnaires, see Table 5-2.

Table 5-2 Features of the standard and abbreviated questionnaires

Feature	Standard questionnaire	Abbreviated questionnaire
Length (in A4 pages)	8	4
Time for completion (minutes)	15	10
Main sections	About you Your views about chronic knee pain Clinical scenario of a patient with CKP Your views about the role of exercise in treating CKP Guidelines	About you Clinical scenario of a patient with CKP Your views about the role of exercise in treating CKP
Versions	Two – one offering an incentive, the other with no offer of an incentive	Two – one offering an incentive, the other with no offer of an incentive

5.2.1.3 Use of an incentive

Evidence indicates that offering an incentive can improve response to physician, patient and general population postal-questionnaire surveys (257,342). However, little is known about the effect of incentives on the completion of questionnaire surveys by GPs specifically. The choice of the incentive used in this survey thus reflected evidence that monetary incentives, particularly large ones (343), seem more effective than non-monetary incentives, which in turn appear to be more effective than no incentive in improving response (257). Offering adequately sized, individual, guaranteed incentives to every GP invited to participate, such as that used by Fielding et al (2005), who obtained a 96% response in their study of 98 GPs (338)), was deemed to be unfeasible for the purposes of this much larger survey. Evidence also suggests that prize draws for larger monetary incentives are no less effective than small guaranteed incentives (344). Thus a prize draw monetary incentive was offered and consisted of entry in a prize draw to win a £100 Amazon voucher following questionnaire completion and response. GPs were not informed of their probability of winning the prize draw. If responding GPs wished to be entered

into the prize draw, they were asked to provide their contact details on a separate consent sheet. The draw took place shortly after the closing date for receipt of completed questionnaires.

The impact of using this type of incentive in this population was tested in the pilot survey by offering an incentive to only half of those receiving each of the StQ and AbQ and comparing the response with those who had not been offered the incentive.

5.2.1.4 Reminder mailings

Strategies such as following-up questionnaires with telephone calls and/or face-to-face visits have resulted in relatively high levels of response (60-100%) among GPs (285,287,327,345). However, such methods represent a significant burden to both researchers and participants and were unfeasible for this large survey. An alternative, evidence-based, strategy is to send follow-up letters and further copies of survey tools (257,339); indeed, de Vaus suggests that two or three follow-ups can achieve response rates similar to those obtained by telephone or personal questionnaires (294). However, it is important to achieve an appropriate balance between burdening GPs with repeat mailings versus improved data quality from improved response. This pilot survey was designed such that a reminder postcard was sent to non-responders two weeks after the baseline mailing and a repeat mailing of the original questionnaire was sent to non-responders at week four. This approach was in accordance with standard practice within the RIPCHS and aligns to de Vaus' suggestion outlined above. The effect of these reminders on response was assessed to inform the reminder process for the main survey.

5.2.2 Identifying risk of response bias: minimum data requests

Whilst there is no clearly defined '*desired*' response rate for surveys it is widely acknowledged that higher levels of response minimise response bias (331-333). However, unless there is 100% response (a census (334)), even a high response does not eliminate this risk (333). In anticipation of a low response and thus significant potential for response bias, an estimate of the likely extent of this bias was sought using minimum data set (MDS) requests. At each mailing, GPs who did not wish to participate were asked to return a MDS, which comprised one multiple response option item requesting the reason for non-participation in the survey and four of the demographic items from the survey tool. The risk of response bias was estimated by comparing the demographic details from responders who completed the questionnaire with those who returned an MDS, and by examining the reasons for non-completion of the survey tool.

5.2.3 Question type

The format of questions and response options in self-report questionnaires may influence the quantity and nature of responses. For example, closed, multiple response options are simple and quick for respondents to answer and easy to record and analyse, but may prompt answers that may not otherwise have been given (302). Further, closed questions, if too restrictive, may result in the responder feeling constrained and thus frustrated, which subsequently risks missing information. This can be avoided by providing a wide range of options based on what is known about the likely responses already, providing an '*other*' response box or by using questions inviting open, free-text responses (302). Open questions avoid leading or prompting particular responses and, when associated with vignettes, have been found to be

better at assessing behaviours of HCPs than medical record review (277,299,300). However, open questions may produce answers that deviate from the intention of the question and can increase the response time, which in turn can reduce response (257,291,338). Further, they are more burdensome than closed questions to code and analyse (302). Given the clear advantages and disadvantages, different question types were used in the StQ (multiple response options) and AbQ (free-text response question) to enquire about the investigations and management of the vignette patient in order to compare the quality and nature of the results and finalise the main survey tool. An '*other*' response option was included in the StQ to allow responders to be as complete and comprehensive in their answers as they desired and to highlight missing response options (325). Novel responses obtained via the free-text questions and '*other*' responses from the closed questions informed multiple response options for the main survey.

5.2.4 The pilot questionnaire versions

To test the effect of questionnaire length, offer of an incentive and different question formats, the original questionnaire was adapted into four versions for the pilot questionnaire survey and each questionnaire type was sent to a different group of GPs. The versions are summarised in Table 5-3 and copies of the StQ and AbQ are provided in Appendix 9 and Appendix 11, respectively. Free-text responses were required for items pertaining to diagnosis (StQ and AbQ), description of diagnosis (StQ), prognosis (StQ), investigations (AbQ), referral (StQ and AbQ), management (AbQ), use of exercise (StQ), GP's perceived role (StQ and AbQ), experiences of implementing CKP guidelines (StQ), where multiple response options included '*other*' or further details were requested for yes/no answers.

Table 5-3 Summary of the four versions of the pilot questionnaire survey

		Incentive	
		Offered	Not offered
Questionnaire length	Standard (StQ)	Group 1	Group 2
	Abbreviated (AbQ)	Group 3	Group 4

5.2.5 Ethical approval processes

Prior to obtaining ethical approval from the Keele University Ethical Review Panel the project went through a process of internal peer review at the RIPCHS. After requested amendments had been made and clarification on specified points had been provided, peer review approval was given and ethical approval could be sought. Ethical approval for the pilot survey was given by the Keele University Ethical Review Panel and NHS R&D approved the pilot survey without any further amendments. Appendix 12 contains copies of the approvals pertaining to the pilot survey.

5.2.6 Population and sample

5.2.6.1 Sampling frame and source

The population of interest for this research was GPs practising in the UK. It is possible that local variations, for example, in access to physiotherapy services, may affect the responses of GPs to this questionnaire. To maximise the likelihood that the results might be as generalisable as possible to the wider UK GP population, a large, national sample of GPs, was required (334). In order to achieve as representative as possible a simple random sample (334) of UK GPs to be invited to participate in this pilot was required. Sources considered for obtaining the sample included professional organisations or associations, but these are problematic as they may introduce bias by over-representing specialist and/or particularly

enthusiastic GPs. The Royal College of General Practitioners (RCGP) was considered, but this would have increased costs as mailing would have to have been administered by that professional body. Binley's database, which contains the contact details of professionals working in UK GP practices, was first published in 1994 (346). It is updated quarterly and is widely used by NHS organisations for healthcare data (346). One of Binley's key services is provision of database samples (346), for which the company uses the programme Microsoft Access' random selection function (personal correspondence). The database is reasonably comprehensive and was identified as a good source of representative UK GP contact details from local researchers' experience (296). In 2012, communication with staff at Binley's highlighted that 33,000 GP partners were included in their database. Although, at the time, 61,000 doctors were registered on the General Medical Council (GMC) GP register (347), coverage of the Binley's database compared favourably with data provided by the British Medical Association, which reported 41,349 GPs working in the UK, of which, 34,081 were GP partners (348). The Binley's database is updated quarterly and is verified every six months (346). A one-year licence was purchased from Binley's and they selected a '*random cut*' (i.e. a simple random sample (334)) of GPs from their database.

5.2.6.2 Inclusion and exclusion criteria

To be eligible for inclusion in the survey respondents had to be qualified GPs (i.e. not trainee GPs) who had treated a patient with CKP in the previous six months. Individuals receiving a questionnaire who did not meet these eligibility criteria were requested to indicate this on the front of the questionnaire and return it without completing any further questions. These individuals were removed from the

denominator for analysis to give an adjusted response. The number of ineligible individuals who received questionnaires was also noted in case adjustment would be necessary during sample size calculations for the main survey.

5.2.6.3 Sample size

The sample size for this pilot survey was established following discussion with experienced statisticians in the RIPCHS and consideration of the compromise between using a large enough sample to achieve an accurate estimate of the likely response and primary outcome (use of exercise) and avoiding unnecessary over-sampling at this stage to minimise burden on GPs and unnecessary use of resources. Approximately 75-100 respondents are desirable for a pilot survey (279). Since two versions of the questionnaire were being tested in this pilot survey, a target of 200 completed questionnaires (i.e. 100 of each version) was viewed as adequate to provide a reasonable estimate of the likely response and of the primary outcome (frequency of use of exercise among this population using each questionnaire type). A response of approximately 25% was expected given a recent UK postal survey of GPs about the management of LBP in which GPs were sampled from Binley's and one reminder mailing was used (296). Therefore a simple random sample of 800 UK GPs (partners, salaried, locum, trainers and other) was requested from Binley's database for the purposes of this pilot survey.

5.2.6.4 Selection of sample to receive each version of the questionnaire

The random sample of 800 UK GPs was selected from Binley's GP database and supplied by Binley's. On receipt, ID numbers from 1-800 were allocated to each

individual sequentially in order to divide the sample into four equal groups as defined in Table 5-4.

Table 5-4 Allocation of the sample into each group

		Incentive	
		Offered	**Not offered**
Questionnaire length	**Standard (StQ)**	Group 1 ID numbers 1-200	Group 2 ID numbers 201-400
	Abbreviated (AbQ)	Group 3 ID numbers 401-600	Group 4 ID numbers 601-800

5.2.7 Undertaking the questionnaire mailing

5.2.7.1 Mailing timetable

All 800 UK GPs included in the pilot survey sample were mailed a study pack on 17th October 2012. The study pack contained a covering information and invitation letter (see Appendix 13), the appropriate questionnaire labelled with the correct corresponding unique ID number, printed on white standard weight paper (80g/m^2) and a pre-paid envelope for reply. Clipped to the questionnaire was a consent form which requested the GPs details if they were happy to be contacted in the future regarding the study and/or if they wished to enter the prize draw (if offered an incentive).

The first reminder mailing sent to non-responders, occurring after two weeks (31st October 2012), consisted of a yellow postcard (Appendix 14), labelled with survey ID numbers, sent in an envelope with the return address provided and postage paid. The second reminder mailing was sent after four weeks (14th November 2012) to non-responding GPs and consisted of a second copy of the original questionnaire, a reminder cover letter (see Appendix 15) and a pre-paid envelope. GPs were advised that the closing date for questionnaire returns was six weeks after the baseline mailing (28th November 2012). However, data from responses received up

until 11 weeks after the baseline mailing (4th January 2013), were included in the analysis for two reasons: 1) to maximise response, and 2) to quantify the number of late responders in order to select the response period for the main survey.

Each GP's allocated unique survey number and contact information provided by Binley's was stored in a password-protected mailing database and held on the University's firewall and password-protected server. On return of the questionnaire, the response (completed questionnaire, MDS, withdrawal request (WD) or ineligible) was recorded against the appropriate survey number in the mailing database. This mailing database was used to determine those who were eligible for the reminder mailings (GPs for whom a response had not been recorded).

5.2.7.2 Obtaining consent from participants

Completion and return of the survey questionnaire was taken to imply the GP's consent to participate in the survey and a statement detailing this assumption was included on the front cover of the questionnaire and in the cover letter. It was felt that a separate consent form was not required for this study as: a) this was a survey of the self-reported practice of HCPs; b) an incomplete consent form accompanying a completed questionnaire would require the questionnaire to be excluded from the study, thus adversely affecting the response and c) this is an accepted method of obtaining consent in HCP research (349,350) which has previously been used in physician questionnaires (351,352).

5.2.8 Data management

5.2.8.1 Data input

Upon receipt of a completed questionnaire, any contact details provided on the future contact consent/prize draw entry form were separated from the questionnaire and filed in a locked cabinet. The author of this thesis inputted all responses into a Microsoft Excel 2010 database and missing values were coded in a standardised way (-9 = missing data, -10 = response unclear (e.g. two boxes on same row ticked or illegible writing) and -88 = response not applicable).

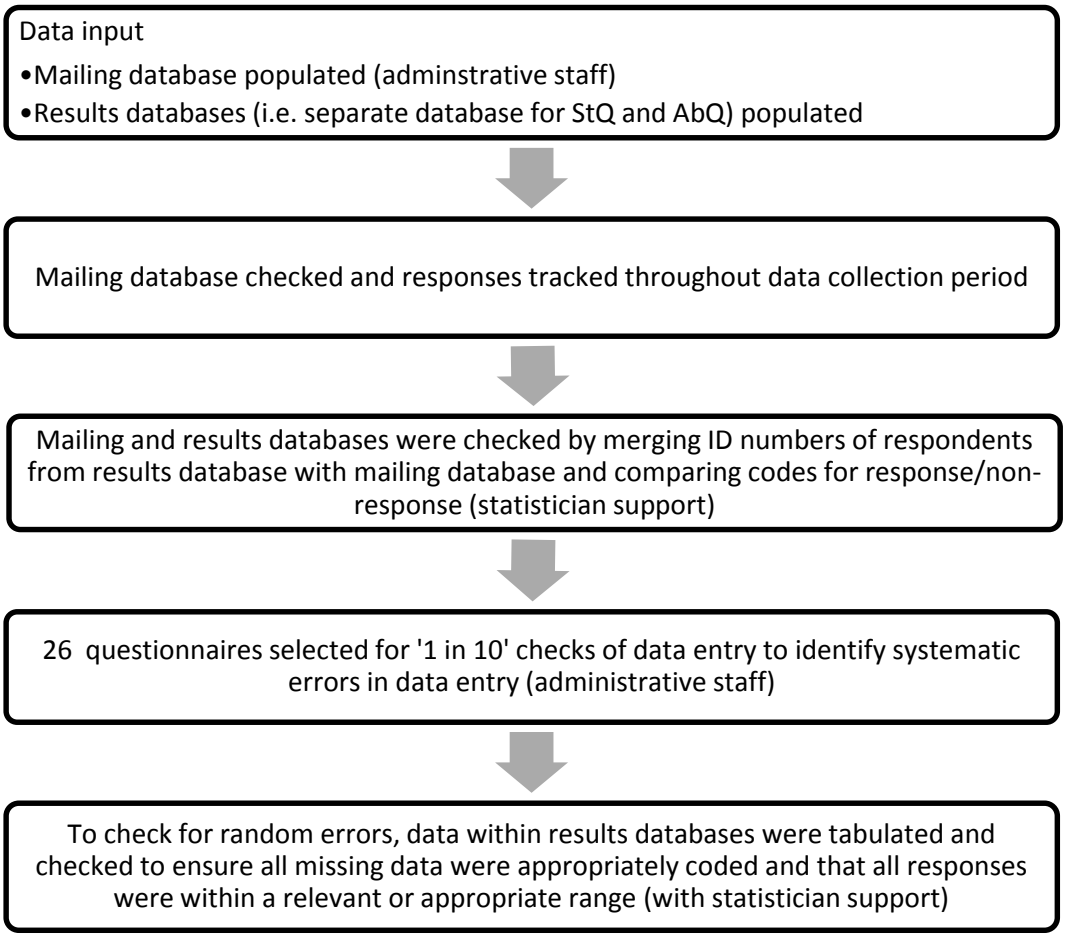
5.2.8.2 Data checking

Accuracy of the mailing database was checked during the survey period by the author of the thesis to detect and correct problems. This process identified occasions where WD had been coded as MDS. The mailing and results databases were cross-checked on completion of data entry to ensure that the nature of response (e.g. MDS, complete questionnaire, WD, excluded) was correctly and completely recorded. No errors in numbers or allocation of codes were identified; the overall number of GPs coded as respondents, excluded or WD was the same between the databases and these overall numbers comprised the same GPs.

The accuracy and consistency of raw data entry was checked by administrative staff who selected one in ten questionnaires for checking. This process involved checking that codes for responses and actual responses were equivalent for each entire questionnaire selected. Figure 5-1 outlines the data checking and cleaning process. Of the 26 questionnaires selected for checks, 20 had no errors, five contained one typo (e.g. ‘5z/week’ instead of ‘5x/week’, ‘pasterclass’ instead of ‘masterclass’) and

one completed questionnaire respondent was found to also have returned a postcard MDS (in this case the MDS response was disregarded).

Figure 5-1 Process of data checking and cleaning



5.2.8.3 Handling of free-text responses

Free-text coding was undertaken using categorisation of common responses and, where appropriate, thematic analysis. Thematic analysis seeks to identify, analyse and report patterns within qualitative data (353). To allow for descriptive analysis, resulting themes can be coded. Braun and Clarke describe six phases of thematic analysis: 1) becoming familiar with the data, 2) generating initial codes, 3) searching for themes, 4) reviewing themes, 5) defining and naming themes and 6) producing the report (353). Familiarisation of the data was achieved during data input as EC

inputted all data. Therefore, phases two-to-five of the free-text analysis will now be described.

For phase two, where an open question in the AbQ had a parallel closed question with multiple responses in the StQ (i.e. items pertaining to investigation and management of the vignette patient), free-text responses were coded according to the predefined options contained in the StQ. Novel responses were coded as '*other*' responses. This was possible as in many cases the response options could be expected (e.g. informed by the systematic review) and/or pre-existed within the multiple response options, and this approach allowed for comparison of frequency of responses between the two question types and rationalised coding of free-text responses. Where there were no pre-existing response options (including those responses coded as '*other*'), concepts arising from the data were identified. For example, among responses relating to diagnosis, concepts included terms such as '*osteoarthritis*', '*anterior knee pain*' and '*degenerative disease*'. Phase three was achieved by grouping similar concepts to create themes, an approach also advocated by de Vaus (354). For example, a theme '*osteoarthritis*' was created under diagnosis which grouped concepts such as '*early arthritis*', '*degenerative changes*', '*osteoarthritis*' and '*patellofemoral arthritis*'. The themes and associated concepts/responses were tabulated and circulated among the supervision team for comment. Areas in which distinction was difficult and/or circumstances when themes seemed to need to be split or condensed were highlighted. Phase four, reviewing the themes, was completed by finalising the themes according to team feedback, naming these themes and amending coding consistently across the dataset. Use of an '*other*' theme for free-text items ensured all concepts were coded

and recognised comprehensively during analysis. A table summarising the final agreed themes with included concepts and examples of associated responses can be found in Appendix 16.

5.2.8.4 Data cleaning

Following completion of free-text coding, all data (original quantitative data and coded free-text) contained in the results database were examined using frequency tables to ensure all missing data were coded as such and no data were coded outside of an acceptable range. Where anomalies were noted, the original questionnaire was reviewed to establish the true nature of the response. No errors were detected in the minimum dataset database, in the StQ database one entry was incorrect ('*42*' instead of '*2*') and six missing data codes were not assigned and in the AbQ database an error with gender code labels was identified and six missing data codes were not assigned.

When GPs had preceded their use of an investigation or management option with terms such as '*possibly*', '*consider*', '*maybe*', '*perhaps*' or '*?*' their response was coded according to the investigation/management that followed because such responses suggested an intent to undertake this option at this point and implied the GP thought this was an appropriate option. However, because investigation and management questions specifically asked about behaviours '*at this point*' in time, responses were not coded if they mentioned plans for the future.

Any management options repeated within multiple, or provided in inappropriate, sections of a questionnaire (e.g. referral, advice, management sections), were grouped together to formulate one single response coded under the most appropriate section and such heterogeneity of responses was noted in order to

inform amendments to the survey tool prior to use in the main survey. For example, if respondents had not ticked '*paracetamol*' as a management strategy in the management question but then suggested paracetamol under the '*other*' category the response was re-coded from '*other*' to '*paracetamol*'. A table outlining such changes can be found in Appendix 17.

5.2.8.5 Data analysis

Once the data had been checked, cleaned and coded, analyses were undertaken. To inform sample size calculations for the main survey, simple descriptive statistics were used to describe the proportions of GPs returning a fully completed questionnaire, a MDS only, the proportion of ineligible GPs, and the proportion that reported using exercise in the management of the vignette patient. To assess response bias, descriptive statistics were used to describe and compare the demographic details of GPs returning a completed questionnaire and an MDS only and the reasons given for non-response among those who completed an MDS only or who declined to participate in the survey were examined. To evaluate the impact of questionnaire length and offer of an incentive, response rates to the four groups were described and compared statistically using Pearson Chi-squared test. The percentage differences in response between (1) those receiving the StQ and those receiving the AbQ and (2) those offered the prize draw monetary incentive and not offered the incentive were calculated with corresponding 95% confidence intervals (CI). The difference in response between those offered versus not offered an incentive was also examined using Pearson Chi-squared test for each questionnaire type separately. To inform the main survey and timeline, the effect of reminder mailings on response was assessed by plotting the response over time, examining

timing of responses and looking at quality of data from questionnaires returned following reminders by assessing the proportions of '*neither agree nor disagree*' responses.

Although this pilot survey was designed primarily to investigate the likely survey response and completion rates, the results obtained also provided a preliminary insight into the pattern of attitudes, beliefs and behaviours of GPs towards exercise for CKP. Exploratory analyses of these survey variables were undertaken to inform further refinement of the survey tool, in particular, question format. Descriptive analyses explored the proportions of specific responses gained from the use of either open or closed questions. Potentially problematic items were identified through the coding of free-text responses (279), assessing levels of missing data (279), identifying items with high proportions of '*neither agree or disagree*' responses and by noting items that produced ambiguous, duplicate, vague, superficial or unexpected data. Given that some items were included to permit investigation of their association with GPs' use of exercise, they needed to be sufficiently discriminative to ensure a completely homogenous response would be unlikely. Therefore heterogeneity of responses was also assessed for some items.

The validity of the vignette was assessed by calculating the proportion of respondents who interpreted the case as depicting a diagnosis of CKP/clinical knee OA and to consider the spread of responses to questions about the severity of the vignette patient's condition. Responses to attitude statements relating to attitudes about NICE guidelines, the MOVE consensus statements, the adapted PABS_PT scores and risk factors for CKP were interpreted using the approach described by Holden et al (175); this is now described. Items relating to the MOVE consensus

statements were divided into those that related to the benefits of exercise and those that related to the delivery of exercise and exercise adherence (87). Items from the adapted PABS_PT were divided into those relating to the biomedical and behavioural subscales. Condensed response categories were created by combining agree/strongly agree and disagree/strongly disagree responses and calculating the proportions of responders in each. Proportions of GPs within each of these condensed categories were interpreted according to unamity = 100%, consensus = 75-99%, majority view = 51-74% and no consensus = 0-50% (175,355). The responses informed the final response options and coding of free-text responses in the main questionnaire survey.

A Pearson Chi-Squared test was undertaken to explore any difference in the response among the four different groups, each receiving a different questionnaire. Differences in response according to questionnaire length and use of incentives were explored by calculating the percentage difference between the relevant two groups and associated 95% CI for these differences. The difference in response between those offered versus not offered an incentive according to questionnaire length was also examined using Pearson Chi-Squared test. Descriptive and Chi-Squared analyses were performed using IBM SPSS Statistics (Version 20). Calculation of percentage difference CIs and plotting of response over time were undertaken using Microsoft Excel (2010).

5.3 Results

5.3.1 Response

Of 800 mailed questionnaires, 172 (22%) completed questionnaires were received (see Figure 5-2). Nineteen additional questionnaires were returned from ineligible

individuals (not currently working as GPs (n=17), not recently managed a patient with CKP (n=2)). Therefore the adjusted response was 172/781 (22%). An additional 74 (10%) GPs returned MDS. In total, 35 (5%) GPs contacted the RIPCHS to WD from, or decline to participate in, the survey.

Of the respondents returning a completed questionnaire 85 (49%) were female. Mean time since qualification was 16.7 years, mean number of GPs working in the respondents' practice was 6.4 and 96 (57%) worked in urban practices. A summary of the demographic details of respondents can be found in Table 5-5.

Figure 5-2 Breakdown of responses according to group

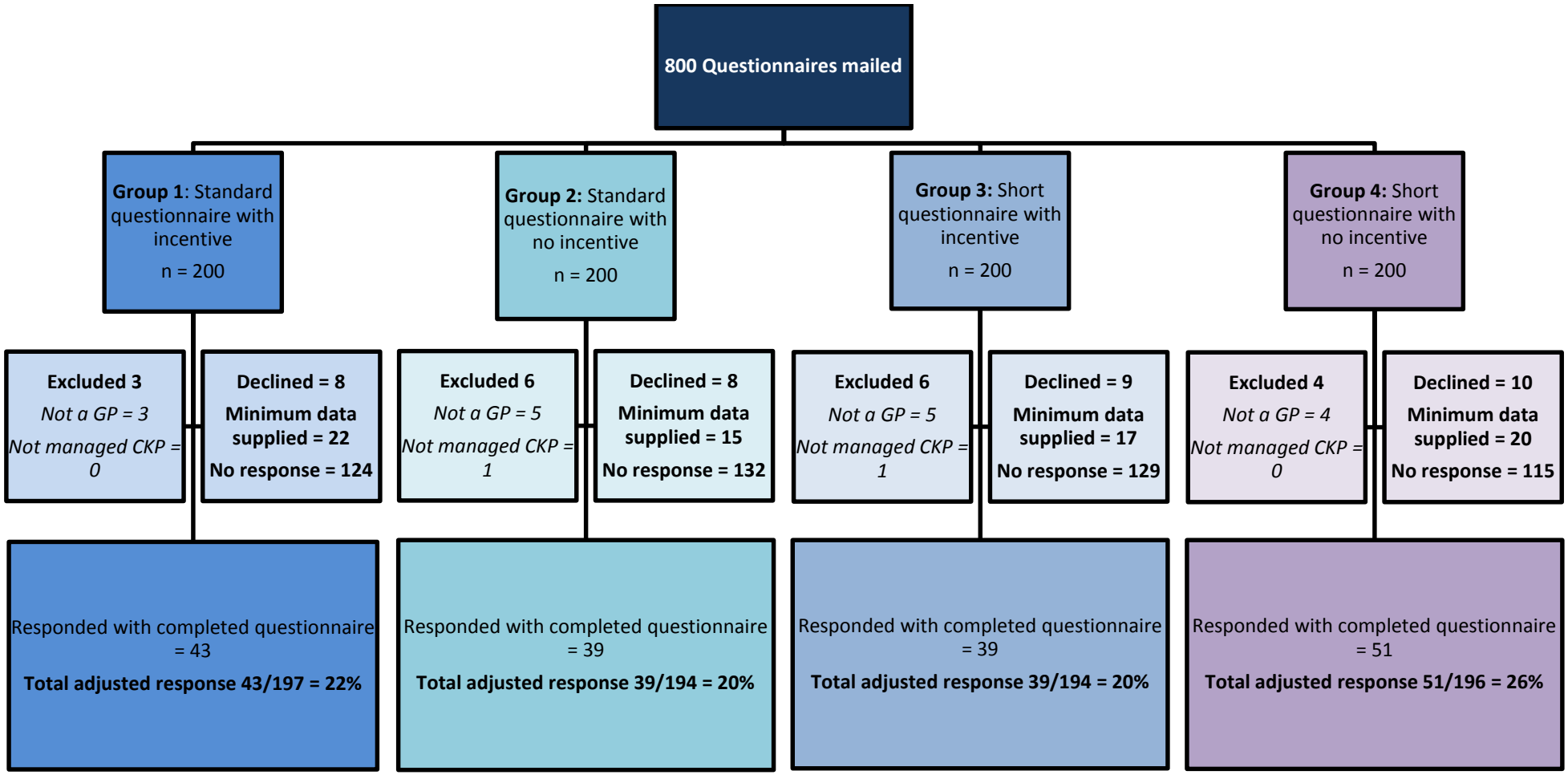


Table 5-5 Demographic details of respondents to the pilot survey

Demographic information		Total n (%)
Gender (n=172)	Female	85 (49%)
Mean (SD) years since qualification (n=168)		16.7 (10.5)
Mean (SD) no of GPs in respondent's practice (n=168)		6.4 (3.2)
Practice type (n=172)	Urban	96 (57%)
	Semi-rural	57 (34%)
	Rural	16 (9%)
Type of GP* (n=82)	GP Partner	57 (70%)
	Salaried GP	18 (22%)
	Locum GP	3 (4%)
	GP Trainer	3 (4%)
GP with special interest in musculoskeletal conditions * (n=81)	Yes	5 (6%)
Received specific undergraduate training in the field of CKP* (n=82)	No	53 (66%)
	Yes	17 (21%)
	Don't know	10 (13%)
Received specific postgraduate training in the field of CKP* (n=82)	No	45 (56%)
	Yes	26 (32%)
	Don't know	10 (12%)
Personal experience of CKP* (n=82)	Yes	14 (17%)

*Data only collected in standard questionnaire (StQ). CKP = chronic knee pain; GP = general practitioner; SD = standard deviation

To explore the likelihood of response bias, the demographic characteristics of GPs responding with an MDS only were compared with those of GPs responding with a completed questionnaire. Table 5-6 shows that these two groups were similar except a higher proportion of male GPs returned the MDS after being sent the AbQ and, on average, those responding with a completed questionnaire were more recently qualified GPs than responding with an MDS. Reasons given for not returning a completed questionnaire were also summarised to assess for risk of response bias. Most GPs providing an MDS (69/74, 93%) cited '*too little time*' as their reason for not completing the full questionnaire. Others responded that the questionnaire was too long (n=5, 7%, all sent StQ), the clinical subject was not relevant to them (n=2, 3%), and the subject was of no interest to them (n=2, 3%).

One GP indicated that they had not completed the questionnaire as they had not been offered remuneration for their time.

Table 5-6 Comparison of demographic details of GPs responding to the pilot survey with a completed questionnaire or a minimum data set grouped according to length of questionnaire

	Response from GPs sent StQ n (%)		Response from GPs sent AbQ n (%)		Statistical test comparing StQ with AbQ respondents
Characteristic	**Questionnaire (n=82)**	**MDS (n=37)**	**Questionnaire (n=89)**	**MDS (n=37)**	
Female gender	42 (51%)	20 (56%) *(n=36)*	42 (47%)	11 (31%) *(n=36)*	Pearson Chi-squared p=0.655
Mean (SD) years since qualification	14.7 (9.8) *(n=81)*	19.1 (8.7) *(n=33)*	18.6 (10.9) *(n=87)*	20.5 (9.7) *(n=30)*	Independent samples T-test Mean difference = -3.82 (95% CI -6.99,-0.66)
Mean (SD) no of GPs in respondent's practice	6.3 (2.9) *(n=79)*	6.1 (3.3) *(n=33)*	6.4 (3.4) *(n=89)*	6.3 (2.7) *(n=33)*	Independent samples T-test Mean difference = -0.11 (95% CI -1.08,0.86)
Practice type					Pearson Chi-squared **p=0.04**
Urban	46 (58%)	20 (56%)	50 (56%)	23 (62%)	
Semi-rural	31 (39%)	13 (36%)	26 (29%)	12 (32%)	
Rural	3 (4%)	3 (8%)	13 (15%)	2 (5%)	

AbQ = abbreviated questionnaire; MDS = minimum data set; StQ = standard questionnaire

Of the 35 GPs who contacted the RIPCHS to WD from the study, 17 (49%) reported that this was because they had too little time, and this included one individual who described being '*overwhelmed with work*', in nine (26%) cases WD was due to the GP no longer working in the practice the questionnaire was posted to, six (17%) GPs provided no reason for WD and three (9%) provided other reasons.

5.3.2 Impact of length and incentive on response

5.3.2.1 Effect of questionnaire length

Of the 391 eligible GPs mailed the StQ, 82 (21%) responded, compared with 90 of the 390 (23%) eligible GPs who responded to the AbQ, see Table 5-7. There was

no significant difference in response rates between the StQ and AbQ (% difference -2.1% (95% CI -7.9, 3.7%)).

Table 5-7 Pilot survey response according to group

		Incentive		Total
		Offered	Not offered	
Questionnaire length	Standard (StQ)	Group 1 43/197 (22%)	Group 2 39/194 (20%)	82/391 (21%)
	Abbreviated (AbQ)	Group 3 39/194 (20%)	Group 4 51/196 (26%)	90/390 (23%)
Total		82/391 (21%)	90/390 (23%)	172/781 (22%)

Pearson Chi-Squared value 2.661, df 3, p = 0.447

Comparison of the demographic details of those responding to the StQ versus the AbQ suggested little difference between the two groups apart from years since qualification (mean greater for those answering AbQ) and practice area (those answering AbQ more likely to be from rural setting; see Table 5-6).

5.3.2.2 Effect of offering an incentive

Eighty-two (21%) of the 391 eligible GPs offered the incentive responded, compared with 90 (23%) of the 390 eligible GPs who were not offered an incentive. There was no significant difference in response between those offered versus not offered an incentive (% difference -2.1% (95% CI -7.9, 3.7%)).

Table 5-8 Comparison of demographic details of GPs responding to the pilot survey with a completed questionnaire or an minimum data set grouped according to whether they were offered an incentive or not

Characteristic	Response from GPs offered an incentive n (%)		Response from GPs not offered an incentive n (%)		Statistical test comparing questionnaire respondents who were offered with those who were not offered an incentive
	Questionnaire (n=82)	MDS (n=39)	Questionnaire (n=90)	MDS (n=35)	
Female gender	37 (45%)	15 (39%) *(n=38)*	46 (52%) *(n=88)*	12 (36%) *(n=33)*	Pearson Chi-squared p=0.351
Mean (SD) years since qualification	15.8 (10.0) *(n=80)*	19.0 (8.6) *(n=32)*	17.6 (10.9) *(n=88)*	20.6 (9.7) *(n=31)*	Independent samples T-test Mean difference = -1.81 (95% CI -5.01,1.40)
Mean (SD) no of GPs in respondent's practice	6.6 (3.0) *(n=81)*	6.5 (3.3) *(n=35)*	6.2 (3.3) *(n=87)*	5.8 (2.5) *(n=31)*	Independent samples T-test Mean difference = 0.40 (95% CI -0.57,1.36)
Practice type	*(n=81)*	*(n=39)*	*(n=88)*	*(n=34)*	Pearson Chi-squared p=0.087
Urban	41 (51%)	27 (69%)	55 (63%)	16 (47%)	
Semi-rural	34 (42%)	10 (26%)	23 (26%)	15 (44%)	
Rural	6 (7%)	2 (5%)	10 (11%)	3 (9%)	

GP = general practitioner; MDS = minimum data set; SD = standard deviation

Comparison of the demographic details of those responding with a completed questionnaire after having been offered an incentive and those who had not suggested no significant difference between the two groups (see Table 5-8). The effect on response of offering an incentive was also examined by looking at each questionnaire type separately. Response to the StQ with an incentive (22%) was not significantly different to response to the StQ without an incentive (20%; Chi-Squared 0.175, df 1, p = 0.675). Although the difference in response for the two types of AbQs was larger, response to the AbQ with an incentive (20%) and to the AbQ with no incentive (26%) was also not significantly different (Chi-Squared 1.923, df 1, p = 0.166).

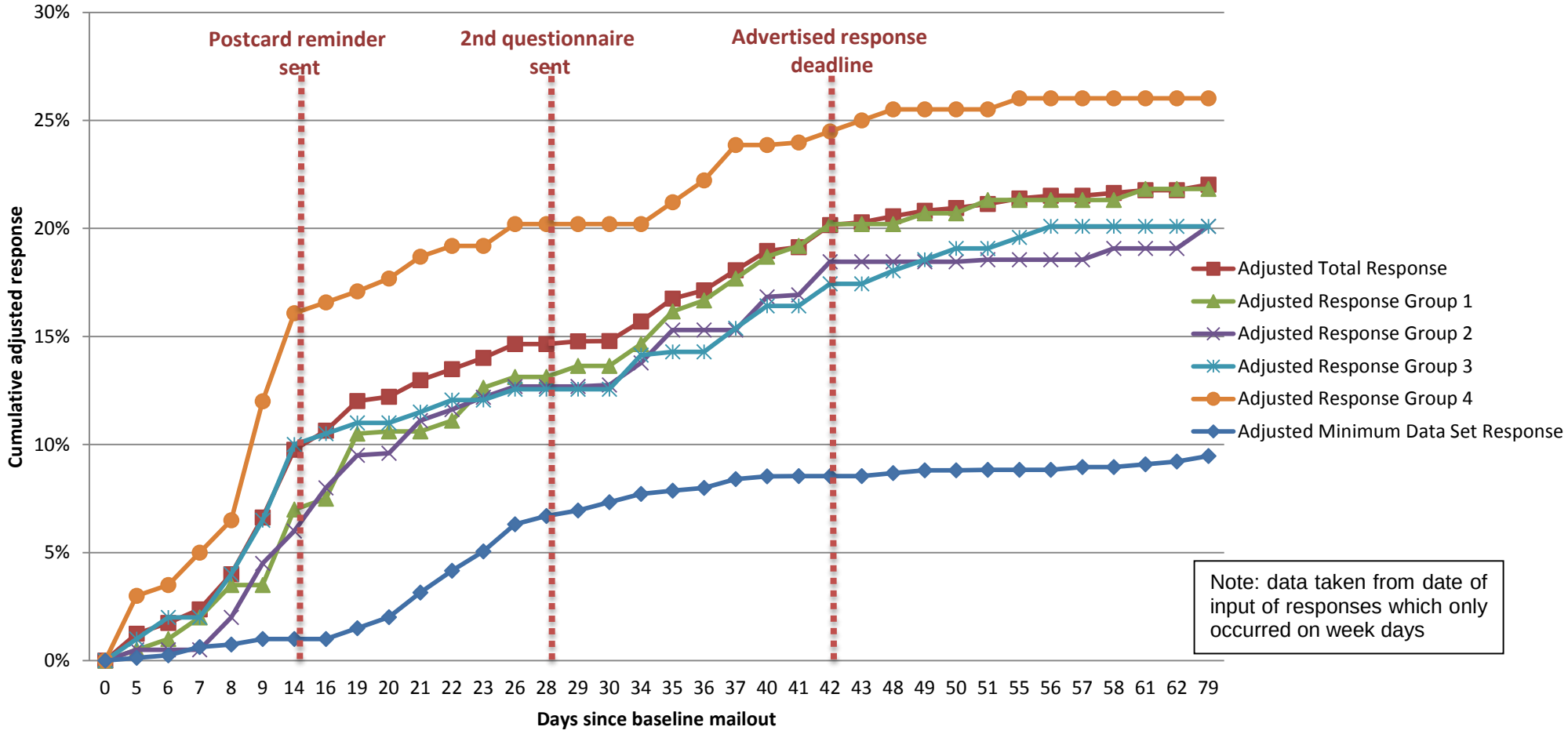
5.3.3 Impact of reminder mailings

To establish the impact of using reminder mailings on response, cumulative response was plotted over time, summarised in Figure 5-3. Of the total 172 responses, only 53 (31%) were received after the initial mailing (Y1), 63 (37%) were received after the postcard reminder mailing two weeks later (Y2) and 56 (33%) were received after the repeat questionnaire mailing four weeks later (Y3).

Of the 300 responses received in total (completed questionnaires, MDS, exclusions and WD), 273 (91%) were received up to and including 28th November 2012, the advertised deadline (week 6). A further 27 responses were received from 29th November up to and including the 4th January 2013, the closing date for data entry (79 days after the initial questionnaire mailing). One response was returned after 4th January 2013 and was not included in the analysis.

The quality of the additional data gained from reminder mailings was assessed by '*neither agree nor disagree*' responses according to timing of response. Such responses provided to the MOVE consensus-derived statements (items 4.1-4.21), showed that although there was fluctuation in the proportion of respondents providing '*neither agree nor disagree*' responses according to response round, there were no consistent trends with respect to frequency of these responses in the data from late respondents; see Table XVIII-A in Appendix 18.

Figure 5-3 Cumulative adjusted response to the pilot over time



5.3.4 Impact of question type on survey responses

The impact of using the two different question formats to investigate GPs' behaviours regarding investigations and management of the vignette patient was established by describing and comparing data on reported investigations and management strategies given by GPs (see Table 5-9 and Table 5-10, respectively). The proportions of GPs reporting to want either no investigations or a knee x-ray to investigate the vignette patient differed little when responses from open and closed questions were compared, see Table 5-9. For other items, marked differences were identified according to question format, such as the use of laboratory tests (StQ=27%, AbQ=12% (see Table 5-9)), paracetamol (StQ=95%, AbQ=39%), quadriceps strengthening exercises (StQ=68%, AbQ=18%), oral NSAID (StQ=59%, AbQ=29%), topical NSAID (StQ=37%, AbQ=16%), ice (StQ=15%, AbQ=2%), heat (StQ=12%, AbQ=1%), insoles (StQ=10%, AbQ=0%) and opiates (StQ=11%, AbQ=3%), see Table 5-10. There was a consistent trend that items provided as closed response options in the StQ were reported to be used more frequently than in free-text responses from AbQ respondents. Respondents to the AbQ's open items provided more non-specific terms, such as 37% stating they would give '*simple analgesia*' in place of details of specific medications (e.g. paracetamol or oral NSAIDs) obtained from closed questions and more responders to the AbQ suggested using glucosamine, which was not given as a response option in StQ (StQ=2%, AbQ=7%).

Table 5-9 Reported investigations according to question format

Investigation	StQ (closed questions) (n=82)	AbQ (open questions) (n=90)	Total (n=172)
Knee x-ray*	67%	67%	67%
None*	34%	34%	34%
Lab test (e.g. inflammatory markers)*	27%	12%	19%
X-ray of other area*	5%	0%	2%
Oxford knee score	0%	2%	1%
Depression screening	1%	0%	1%
Special imaging*	1%	0%	1%
Synovial fluid aspirate/analysis*	0%	0%	0%

*Given as multiple response option in StQ. AbQ = abbreviated questionnaire; CT = computed tomography; MRI = magnetic resonance imaging; StQ = standard questionnaire. Special investigations included e.g. CT, MRI, myelogram, bone scan.

Table 5-10 Reported management according to question format

Treatment category	Treatment	StQ (closed questions) (n=82)	AbQ (open questions) (n=90)
Oral medication	Non-selective NSAID*	59%	29%
	Paracetamol*	95%	39%
	Opiates*	11%	3%
	COX II inhibitor*	5%	0%
	Antidepressants*	1%	0%
	Simple analgesia**	0%	37%
	PPI (to cover NSAID)	1%	1%
Topical medications	NSAID*	37%	16%
	Capsaicin*	10%	0%
	Other (e.g. rubefacient, not stated)	1%	1%
Injections	Hyaluronan*	0%	0%
	Steroids*	6%	2%
Physical treatments	Insoles*	10%	0%
	Provision of walking stick*	2%	0%
	Heat*	12%	1%
	Ice*	15%	2%
	TENS*	1%	0%
	Acupuncture*	6%	0%
	Support or supportive bandage	0%	2%
	Taping of patella	0%	1%
Activity/ exercise	Bed rest*	0%	0%
	Rest*	7%	1%
	Quadriceps strengthening exercises*	68%	18%
	General exercise*	83%	66%
	Exercise of any type	92%	79%
Other*	Alternative therapy^	4%	1%
	Glucosamine	2%	7%
	NHS Health Check	0%	1%
	Miscellaneous	1%	0%
None*		0%	0%

*Given as multiple response option in StQ; **not otherwise specified; ^e.g. rosehip, magnetic band. AbQ = abbreviated questionnaire; COX = cyclooxygenase; NHS = national health service; NSAID = non-steroidal anti-inflammatory drug; PPI = proton pump inhibitor; StQ = standard questionnaire; TENS = transcutaneous electrical nerve stimulation.

5.3.5 Detection of problematic questionnaire items

Problematic questionnaire items were detected by looking at proportions of missing data and '*neither agree or disagree*' responses, items flagged by GPs as being difficult to answer and items that provided responses of limited value. These will now be presented in turn.

5.3.5.1 Problematic questionnaire items: missing data, ambivalent responses or difficult to answer questions

Aside from items asking for demographic details and the final question that asked GPs to share their experiences of implementing guidelines in the management of CKP (which may not be relevant to all GPs if they are unaware of guidelines), there were very few missing data in the pilot survey responses. The highest level of missing data for a question was 8% for the item enquiring about GPs' beliefs about their role '*as a GP in exercise as a treatment for CKP*'. Uncertainty or ambivalence may be indicated by neither agree nor disagree responses. Such responses were least frequent among attitude statements relating to the cause of CKP (0-31%) and most frequent among three of the adapted PABS_PT items (44-49%), two items relating to the value of NICE guidelines (42-49%, Table 5-11) and in relation to whether respondents believed managing patients with CKP is a priority for GPs (47%). GPs working in Scotland indicated that answering questions about NICE guidelines is problematic as GPs in Scotland predominantly use SIGN guidelines.

5.3.5.2 Problematic questionnaire items: responses of limited value

Examining responses to the attitude statements enquiring about the value of NICE guidelines revealed little or no consensus about the perceived primary target of the

guidelines and no consensus about whether the NICE guidelines were felt to be easily implemented in real-life situations, see Table 5-11.

Table 5-11 Consensus among pilot survey responses to the attitude statements relating to NICE guidelines

Attitude statement	(Strongly) disagree	Neither disagree or agree	(Strongly) agree
Item included in both StQ and AbQ (n=172)			
NICE is a credible source of guidance	2%	9%	89%
Items only included in StQ (n=82)			
NICE guidelines improve my management of patients	9%	25%	67%
NICE guidelines are primarily targeted at secondary care	40%	49%	11%
NICE guidelines are primarily targeted at GPs	32%	42%	27%
NICE guidelines are primarily targeted at allied health professionals	54%	35%	11%
NICE guidelines are easily implemented in real-life situations	36%	33%	31%

Consensus categorised according to: unamity = 100% (red), consensus = 75-99% (orange), majority view = 51-74% (yellow), no consensus = 0-50% (blue). Maximum missing data for any item was 1%

When GPs reported that they would use exercise, those responding to the StQ were asked to provide detail about the exercise advice they would give (StQ3.12). Many such responses related to '*keeping active*' rather than exercise specifically. Of those who did provide information relating to exercise advice, the focus was broad and little information was gained in addition to responses to item StQ3.11 '*what kind of exercise would you suggest to this patient at this stage*' (see Table 5-12).

Table 5-12 Content of exercise advice given to patient from pilot survey responders

Content of exercise advice	Proportion providing response (n=70)
Mechanism of action of exercise	33%
Exercise intensity	27%
Description of specific exercise	24%
Intended outcome of exercise	23%
Exercise frequency	11%
What to do in response to pain	9%
Non-specific information given	7%
Potential for exercise to cause harm (or not)	4%
Desired duration for which exercise should continue	3%
Giving a leaflet	3%
Demonstration of exercise	1%
Undertaking activities of daily living	1%

Responses to the item enquiring about GPs' beliefs about their role as a GP in exercise as a treatment for CKP (StQ4.22, AbQ3.22) were varied, however, some responses did not directly answer the question. For example GPs responded with issues relating to diagnosis, prescribing and identifying '*red flags*' as well as barriers to fulfilling their desired role (see Table 5-13).

GPs were invited to share their experiences of implementing guidelines when managing patients with CKP (StQ5.8). Only 48% GPs who responded to the StQ provided information. Experiences provided were heterogeneous, responses related to: guidelines used, aside from NICE OA guidelines; implementation of guidelines; use of guidelines to inform management; and difficulties with using guidelines and deviations from guidelines (see Table XVIII-B in Appendix 18).

Table 5-13 Summary of GPs' beliefs about their role in incorporating exercise into the management of a patient with CKP

Role	Proportion offering the role (n=158)
Advise, recommend or encourage use of exercise	81%
Refer to other service providers	26%
Provide written information or exercise sheet	14%
GP role is limited, can only give brief/basic detail or information	12%
Monitoring pain, exercise and symptoms	10%
Reassure about the safety of exercise and/or about the condition itself	8%
GP gives general, and physiotherapist gives specific, information	5%
GP role is significant	5%
Not to follow-up*	4%
Demonstrate exercises	3%
No role	1%
Barriers to fulfilling ideal role	
Have insufficient time	8%
Have insufficient expertise	8%
Difficulties accessing services	2%
Responses unrelated to exercise	
Diagnose	3%
Prescribe	2%
Identifying 'red flags'	1%

*Possibly triggered by StQ 4.12 and AbQ 3.12 CKP = chronic knee pain, GP = general practitioner

5.3.6 Preliminary insight into attitudes, beliefs and behaviours of GPs regarding exercise for CKP

The primary purpose of the pilot survey was to collect data that would inform the sample size calculation and the finalisation of the survey tool for use in the main survey. However, analyses of the results on the attitudes, beliefs and behaviours of GPs regarding exercise for CKP were undertaken to identify novel responses that were not included in the multiple response options, redundant response options, to determine whether the data elicited from questionnaire items were consistent with that which they were designed obtain and to gain an insight into the likely use of exercise among GPs to inform sample size calculations for the main survey. These results are now described.

5.3.6.1 Diagnoses given to the vignette patient: validity of the vignette

Diagnoses given to the vignette patient were examined to assess the validity of the vignette. Only one of the 172 respondents did not provide a diagnosis. Reported diagnoses given by the remaining 171 GPs included knee OA (85%, including those who thought this probable), wear and tear (10%), CKP (1%), and one person gave the diagnosis of '*wear and tear and repair arthritis*' (see Table 5-14).

Table 5-14 Diagnostic terms given to the vignette patient by pilot survey respondents

Diagnosis suggested	Proportion giving each diagnosis (n=171)
OA*	45%
Probable/likely OA*	40%
Wear and tear	10%
Wear and tear and repair	1%
CKP**	1%
Probable/likely CKP**	1%
Patellofemoral or anterior knee pain	4%
Obesity	4%
Other	5%
None	4%

*/** indicate responses that were mutually exclusive, otherwise multiple responses could be given. CKP = chronic knee pain; OA = osteoarthritis

The vignette patient was based on a patient with mild functional impairment (WOMAC physical function score of 20). GPs responding to the StQ were asked to provide an indication of their perception of the severity of the patient's symptoms and the underlying knee damage and their perceptions were generally aligned to the vignette case. Most (56/80, 70%) respondents believed the vignette patient's symptoms were moderate, 13 (16%) mild and 11 (14%) severe. Regarding underlying knee damage, 40 (49%) believed the underlying damage was (very) mild, 36 (44%) moderate and 6 (7%) severe.

5.3.6.2 Analysis of behaviours

Investigations

Of the 172 respondents, 115 (67%) reported they would request a knee x-ray for the vignette patient and 59 (34%) stated that they would not request any investigations. Doing and not doing investigations were not mutually exclusive responses as some GPs stated they act according to the patient's preference (e.g. *'If major patient concern may request an x-ray*'). No GP stated they would undertake synovial fluid aspirate/analysis and only one stated they would want any '*special imaging*' (see Table 5-9). A novel response identified by the open question in the AbQ was the Oxford knee score (n=2; 1%). This is not technically an investigation but a patient-reported outcome measure developed to assess pain and functioning after knee arthroplasty (356). A further novel response, depression screening (n=1), was identified through the '*other*' response category in the closed StQ item. Some GPs provided additional comments suggesting reasons for undertaking investigations which included: i) confirming/refuting a diagnosis (*'Very likely it is osteoarthritis...further investigation and follow-up is necessary to make precise diagnosis*'), ii) requirements for referral criteria *('...our PCT MSK Service want these before ref....*') and iii) to make treatment plans ('*Treatment to be reviewed in light of therapeutic response or x-ray results…*').

Management

Among the 172 respondents, 146 (85%) GPs reported that they would use exercise of any type for the vignette patient. General exercise was reported more frequently than quadriceps strengthening exercises (74% vs 42%, respectively, see Table 5-15); 31% of GPs reported using both quadriceps strengthening exercises and

general exercise. Management approaches used for the vignette patient are presented in Table 5-15, organised according to the approaches recommended by NICE at the time the survey was undertaken (357). Novel responses provided in free-text responses included glucosamine (n=8), alternative therapies including rosehip and magnetic bands (n=4), supportive bandaging (n=2), proton pump inhibitors (PPI) if prescribing NSAIDs (n=2), rubefacients (n=2), patella taping (n=1) and NHS health check (n=1).

Table 5-15 Management approaches used for the vignette patient by pilot survey respondents

Management approach as recommended by NICE	Frequency of use (n=172)
Core treatments	
Education, advice, information access	81% (general advice) 27% (written information)
Aerobic fitness training/general exercise	74%
Strengthening exercise	42%
Weight loss if overweight/obese	68%
Second-line treatments	
Paracetamol	66%*
Topical NSAIDs	26%
Third-line treatments**	
Oral NSAIDs	43%*
COX-2 inhibitors	2%
Opiates	7%
Capsaicin	5%
Intra-articular corticosteroid injections	4%
Local heat	6%
and cold	8%
Assistive devices	1%***
TENS	1%
Shock-absorbing shoes or insoles	5% (insoles)
Supports and braces	1%****

*An additional 19% respondents stated they would use 'simple analgesia', **Joint arthroplasty and manual therapy in the guidelines but not suggested by respondents, ***Walking stick, ****Support or supportive bandage. COX = cyclooxygenase; NICE = National Institute for Health and Care Excellence; NSAID = non-steroidal anti-inflammatory drug; TENS = transcutaneous electrical nerve stimulation

Of the 75 respondents to the StQ suggesting they would use exercise of some type, 71 (95%) provided detail of the '*kind of exercise*' they would suggest. Swimming (n=33, 47%), quadriceps strengthening exercises (n=33, 47%), walking (n=28, 39%) and cycling (n=17, 24%) were suggested most frequently. Six (9%) GPs used terms

such as '*gentle*', *'light*', '*mild*' and '*low impact*' when describing the exercise type. As previously described, information about the advice GPs would give to patients about exercise was heterogeneous (see Table 5-12). Responses to the item asking whether GPs would check to see if the patient was completing her exercise programme were incomplete; two GPs did not answer this at all, 30 (42%) GPs stated they would follow-up patients, of whom one did not state how. Strategies to check adherence included a review appointment (n=17, 59%), using a third party (n=3, 10%), on an *ad hoc* basis (e.g. during medication reviews; n=2, 7%), if the patient's symptoms failed to improve (n=2, 7%) or using the telephone (n=1, 3%). Only six (21%) GPs suggested a timescale for this review (see Table XVIII-C in Appendix 18).

Referral

Of the 171 respondents who provided information on whether or not they would refer the vignette patient at this point, 74 (43%) GPs suggested at least one referral. The most frequent referral destination was physiotherapy (n=70); others included musculoskeletal clinic (n=5), exercise programme (n=5), dietician (n=5), weight management service (n=3), orthopaedics (n=3) and occupational health (n=1).

5.3.6.3 Analysis of attitudes and beliefs

Results pertaining to the attitudes and beliefs about CKP in general are now presented, before describing those specifically regarding exercise for CKP.

Attitudes and beliefs about CKP

The adapted PABS_PT was included in the questionnaire to investigate GPs' attitudes about CKP by determining their treatment orientations. However, during

analysis of the results an error made during questionnaire development was identified. The PABS_PT was developed using a six-point Likert Scale, whereas a five-point scale had been included in the pilot questionnaire. Although this precluded calculation of treatment orientation scores, patterns of response could be examined by assessing for heterogeneity among the answers for each item. Although no items had unanimous responses and consensus was variable across the items, there was a general trend towards GPs having attitudes in line with a behavioural treatment orientation (see Table 5-16).

Regarding GPs' beliefs about the role of GPs in the management of CKP, GPs were almost unanimous (99%) that it is part of the GP's role to manage people with CKP, however heterogeneity was seen among all other items, see Table 5-17. The only unanimous response that was obtained in this pilot survey was associated with the belief that '*being overweight/obese*' is a cause of CKP. Among the other causes of CKP listed, heterogeneity was observed, see Table 5-18.

Attitudes and beliefs about the use of exercise for CKP

MOVE consensus-derived attitude statements, were used to investigate GPs' attitudes and beliefs about the use of exercise for CKP. Although there was a consensus of agreement for some items, overall, responses were heterogeneous and responses did not reach unamity for any statement (see Table 5-19 and Table 5-20). Among the 158 GPs who indicated their beliefs about their role in exercise as a treatment for CKP, views were heterogeneous (see Table 5-13). However, most GPs suggested they should advise, recommend or encourage the use of exercise (n=128, 81%). Eight GPs felt they have a significant role and one felt they have no role.

Table 5-16 Level of agreement among pilot survey responses to adapted PABS_PT items

Attitude statement (n=82)	(Strongly) disagree	Neither disagree or agree	(Strongly) agree
Biomedical subscale			
CKP indicates the presence of organic injury	55%	37%	9%
The severity of tissue damage determines the level of pain	78%	13%	9%
Patients with CKP should preferably practise only pain free movements	71%	20%	10%
Increased pain indicates new tissue damage or the spread of existing damage	58%	30%	12%
If patients complain of pain during exercise, I worry that damage is being caused	67%	16%	17%
Pain is a nociceptive stimulus, indicating tissue damage	27%	44%	29%
Pain reduction is a precondition for the restoration of normal functioning	24%	35%	40%
If therapy does not result in a reduction in CKP, there is a high risk of severe restrictions in the long term	27%	31%	43%
If CKP increases in severity, I immediately adjust the intensity of my treatment accordingly	21%	33%	46%
In the long run, patients with CKP have a higher risk of developing severe functional impairments	9%	18%	73%
Behavioural subscale			
The cause of chronic knee problems is unknown	49%	44%	7%
There is no effective treatment to eliminate chronic knee problems	70%	22%	9%
Functional limitations associated with chronic knee problems are the result of psychosocial factors	26%	49%	26%
Even if the pain has worsened, the intensity of the next treatment can be increased	24%	40%	37%
Exercises that may be knee straining should not be avoided	23%	23 %	54%
Mental stress can cause chronic knee problems even in the absence of tissue damage	18%	21%	61%
Therapy may have been successful even if pain remains	10%	14%	77%
Learning to cope with stress promotes recovery from chronic knee problems	0%	15%	86%
A patient suffering from a severe chronic knee problem will benefit from physical exercise	4%	10%	87%

Consensus categorised according to: unamity = 100% (red), consensus = 75-99% (orange), majority view = 51-74% (yellow), no consensus = 0-50% (blue). CKP = chronic knee pain. Maximum missing data for any item was 1%.

Table 5-17 Level of agreement among pilot survey responses about the role of GPs in the management of CKP

Attitude statement (n=172)	(Strongly) disagree	Neither disagree or agree	(Strongly) agree
It is part of a GP's job to manage people with CKP	1%	0%	99 %
GPs have enough time to manage patients with CKP	18%	22%	60%
Managing patients with CKP is of clinical interest to me	11%	33%	56%
Managing patients with CKP is a priority for GPs	22%	47%	32%

Consensus categorised according to: unamity = 100% (red), consensus = 75-99% (orange), majority view = 51-74% (yellow), no consensus = 0-50% (blue). CKP = chronic knee pain; GP = general practitioner. Missing data for each item was 1%

Table 5-18 Level of agreement among pilot survey responses about the possible causes of CKP

Cause of CKP (n=82)	(Strongly) disagree	Neither disagree or agree	(Strongly) agree
Hereditary/runs in the family	33%	31%	34%
A person's own mental attitude e.g. thinking about life negatively	10%	28%	62%
Changes consistent with osteoarthritis seen on x-ray	11%	24%	65%
A person's emotional state e.g. feeling down, anxious	10%	19%	72%
Manual work	6%	21%	73%
Sport	10%	15%	75 %
Ageing	6%	9%	85%
Accident or injury	0%	4%	97%
Osteoarthritis	0%	3%	98%
Being overweight/obese	0%	0%	100%

Consensus categorised according to: unamity = 100% (red), consensus = 75-99% (orange), majority view = 51-74% (yellow), no consensus = 0-50% (blue). CKP = chronic knee pain. Maximum missing data for any item was 5%

Table 5-19 Level of agreement among pilot survey responses to MOVE consensus-derived attitude statements

Attitude statement	(Strongly) disagree	Neither disagree or agree	(Strongly) agree
Items relating to the benefits of exercise			
GPs should prescribe general exercise, for example, walking or swimming, for every patient with CKP	6%	9%	86%
Knee problems are improved by general exercise, for example walking or swimming	4%	12%	84%
Knee problems are improved by quadriceps strengthening exercises	0%	19%	81%
GPs should prescribe quadriceps strengthening exercises to every patient with CKP	11%	19%	70%
General exercise, for example walking or swimming is safe for everybody to do	21%	18%	61%
Quadriceps strengthening exercises for the knee are safe for everybody to do	20%	30%	50%
Increasing the strength of the muscles around the knee stops the knee problem getting worse	23%	28%	49%
Exercise is effective for patients if an x-ray shows severe knee osteoarthritis	26%	26%	49%
Increasing overall activity levels stops the knee problem getting worse	30 %	36%	34%
Exercise works just as well for everybody, regardless of the amount of pain they have	59%	26%	15%
Items relating to the delivery of, and adherence to, exercise			
GPs should educate CKP patients about how to change their lifestyle for the better	0%	1%	99%
It is the patient's own responsibility to continue doing their exercise programme	2%	8 %	90%
Exercise for CKP is most beneficial when it is tailored to meet individual patient needs	1%	12%	88%
How well a patient complies with their exercise programme determines how effective it will be	3%	12%	86%
It is important that people with CKP increase their overall activity levels	4 %	11%	85%
GPs should follow-up patients to monitor extent of continuation of exercises	23 %	36%	41%
A standard set of exercises is sufficient for every patient with chronic knee problems	59%	30%	11%

Consensus categorised according to: unamity = 100% (red), consensus = 75-99% (orange), majority view = 51-74% (yellow), no consensus = 0-50% (blue). CKP = chronic knee pain; GP = general practitioner. Maximum missing data for any item was 2%

Table 5-20 Level of agreement among pilot survey responses to attitude statements investigating potential barriers to the use of exercise

Attitude statement	(Strongly) disagree	Neither disagree or agree	(Strongly) agree
Exercise for CKP would be used more frequently if access to physiotherapy was easier	11%	10%	79%
Time constraints prevent GPs from providing advice on individual exercises for CKP	20%	15%	66%
Exercise for CKP is only effectively provided by physiotherapists	80%	11%	9%
Exercise for CKP should only be used after drug treatment has been tried	96%	4%	1%

Consensus categorised according to: unamity = 100% (red), consensus = 75-99% (orange), majority view = 51-74% (yellow), no consensus = 0-50% (blue). CKP = chronic knee pain; GP = general practitioner. Missing data for all items was 1%

5.4 Discussion

The pilot survey was undertaken to inform the main survey through obtaining information to calculate the required sample size and to finalise the main survey tool and methodology. The following sections discuss what the results mean in terms of factors that influence response, the impact of question type and GPs' use of exercise for CKP in the context of previous literature before the implications for the main survey are outlined. A summary of the changes arising as a result of the pilot survey is presented in Appendix 19.

5.4.1 Influences on response and implications

5.4.1.1 Overall response

The low response to this pilot survey (22%) falls at the lower end of the response observed to physician questionnaires included in the systematic review (7-94% (123,165,178,180,237,238,241-243,246,248)) and is similar to other recent GP postal surveys conducted from the RIPCHS addressing back pain (22%) (296), polymyalgia rheumatica (PMR, 26%) (358) and OA monitoring (31%) (330). However, the response to the AbQ (four-pages, 899 words) was less than the 60%

predicted by Jepson et al (2005) who reported response according to questionnaire length (defined by the number of words within a questionnaire) (341). A higher response to another survey undertaken in the RIPCHS which investigated sickness certification practices and used one reminder stage (41%) (329) may suggest that the low response to the pilot may be explained by lack of interest in musculoskeletal topics. Rashidian et al (359) examined response according to topic when two similar survey designs were used and found that topic does seem to influence response (statins 27%, asthma 19%). Indeed, among pilot respondents, who are likely to represent the most interested GPs in the sample, only 56% agreed that managing patients with CKP was of clinical interest to them. Although, low response to GP surveys focussing on musculoskeletal problems is not infrequent, it is not inevitable. Among surveys undertaken at the RIPCHS response according to topic has ranged from 22% for LBP (296,360), 25% for PMR (361), 28% for rheumatoid arthritis (362) and 31-46% for OA (123,168) and among surveys undertaken from institutions other than the RIPCHS, response rates to surveys focussing on knee OA have ranged from 7% to 94% (165,178,180,237,238,241-243,246,248). Thus it is likely that interest is only one of many factors that determine whether or not GPs participate in surveys.

5.4.1.2 Impact of questionnaire length on response

Given that this pilot survey, and the other similar surveys from the RIPCHS referenced above, revealed no relationship between the length of the questionnaire and response, the relationship between response and length may not be linear. It is possible that a threshold applies to questionnaire length at which GPs choose to respond or not (279,341). This threshold may be determined by actual length,

perceived time for completion and/or interest in the topic. The lack of difference in response according to questionnaire length in the current pilot survey could be explained by both questionnaires being viewed as on one-side of such a cut-off and/or the difference in length between the StQ and AbQ being inadequate to elicit a change in response behaviour. Given that the AbQ provided less information about the attitudes of GPs, and there was no impact on response from having a longer questionnaire, a questionnaire the same length as the StQ was developed for the main survey. However, in an attempt to reduce the burden of response, and promote GPs to complete and return a questionnaire, an alternative strategy, the provision of an electronic response option was considered for the main survey. This is discussed further in the next chapter (Section 6.2.1).

5.4.1.3 Impact of the incentive on response

The lack of effect on response of offering a prize draw monetary incentive was inconsistent with the findings of many previous physician, patient and general population studies (257). However, the results were consistent with those obtained from a survey of Canadian physicians (including family physicians) (293), which found that this type of incentive, used in this way had no significant impact on response. Two features of the incentive offered in this pilot may have reduced its effect; it was i) a prize draw and ii) a gift voucher. Entry into a lottery is classed as a non-monetary incentive and, as such, can be less effective than a monetary incentive (257). The incentive offered in this survey was entry to a prize draw for which a single winner was certain. This is different to being given a lottery ticket or scratch card but may have reduced the effect compared with a guaranteed incentive. Gift vouchers may be considered as monetary, particularly in this case,

as they provide an explicit value of currency to spend in a widely-known online shop which sells a vast range of products. However, vouchers are sometimes classed as non-monetary incentives (257). Despite this, previous work suggests that non-monetary and/or voucher incentives should improve response in surveys of HCPs and the general population (257,363) so these issues do not wholly explain the lack of effect on response identified in this survey. Other possible explanations for the lack of impact of the incentive in this survey are that the prize may have been perceived to be of insufficient value by this relatively wealthy target population and, given that the probability of winning was not communicated, the GPs may not have perceived this to be great enough to offset the burden of replying. It is also possible that the incentive offered would have had more effect if entry to the prize draw had occurred regardless of whether the GP completed the questionnaire (i.e. unconditional) rather than only after receipt of the completed questionnaire (257,363) or if the incentive had consisted of an automatic smaller financial payment to all respondents rather than entry into a prize draw for a larger value. However, providing meaningful automatic remuneration to a large sample of GPs to undertake the main survey would render the research impractical. Given that the offer of a reasonable incentive had no effect on response, and that the offer of incentives has the potential to result in response bias and problems with generalisability (252), the decision was taken to not incorporate an incentive in the main survey. This decision is supported by Ives et al (2009) who suggest that GPs' participation in research is '*rational and ethical*' and, as a result, they '*should not expect financial incentives to discharge their moral obligation to participate in research*' (364).

5.4.1.4 Impact of reminder mailings on response

The value of reminder mailings was demonstrated by approximately one-third of all responses being received after each reminder mailing. Given that the proportion of ambivalent/uncertain responses remained stable regardless of when the response was received, there was no evidence for decreasing quality of the data among later responses. The use of two reminder mailings was thus retained for the main survey.

Despite a response deadline of 28th November 2012 being given, the database remained open until 4th January 2013, after which time only one further response was received. The deadline for the pilot was particularly necessary due to the need to undertake the prize-draw, however, the main survey still required a defined end-point so that the database could be closed to new responses and the data checked, cleaned and locked-down for analysis. As most responses to the pilot were received within eight weeks following the initial questionnaire mailing, this appeared to be an optimal timescale for responses to the main survey.

5.4.1.5 Appropriateness of Binley's database as a sampling frame

Given that only 19 (2%) recipients returned questionnaires indicating that they met exclusion criteria and only nine GPs in the sample were WD because they were currently not working in the practice the questionnaire was sent to, Binley's database appeared to be an appropriate sampling frame for the main survey. Adjustment of the sample size to accommodate this proportion of ineligible GPs was unnecessary.

5.4.2 Impact of question type

To enquire about the investigation and management of the vignette patient, closed questions were used in the StQ and open questions were used in the AbQ. For

some items, for example, use of no investigations or use of a knee x-ray there was little difference between responses from open and closed questions. However, a marked difference (in some cases a doubling or more of proportions) was identified among some items, for example, regarding the use of paracetamol, oral and topical NSAIDs and quadriceps strengthening exercises. Similar findings were obtained in a survey that asked English GPs to indicate the factors that would prompt them to send a stool sample for microbiological examination in the management of infectious diarrhoea (365). When free-text responses were compared with responses to closed questions on the following page, some factors were reported with almost identical frequency, other responses showed higher frequencies from the closed responses and free-text questions prompted novel responses (365). It is possible, therefore, that multiple choice questions may serve as a prompt and may risk overestimating clinicians' behaviour. A counter argument is that open questions may result in underestimates of behaviour if clinicians do not remember or report everything that they do. Results from the pilot survey gave little indication that closed questions constrained responses as only a very small number of additional, relevant novel responses arose from free-text responders; for example, NHS Health Check (n=1), taping of the patella (n=1), or supportive bandaging (n=2).

This pilot survey highlighted the burdensome nature of inputting and analysing free-text responses. For example, without the direction of multiple response options, some free-text responses were poorly focused to the question. For example '*weight loss'* was provided for the item enquiring about investigations. Data cleaning was time consuming as sub-optimally positioned responses had to be recoded into more appropriate items. Further, respondents focused their responses on a variety of different topics. For example, responses to the management question included

investigations, referrals, treatments, advice, written information, follow-up and possible future management strategies, but not every respondent gave responses relating to each of these elements. This prevents quantification of the use of each strategy as some GPs may not have provided a certain response because their answer had a different focus, rather than because that response did not apply to them. The value of some free-text responses was limited due to their non-specific nature: for example, '*Aim to reduce symptoms and agree on goal for management with patient*'. When faced with closed questions, responses about analgesia related to specific drug types, such as paracetamol or oral NSAIDS, whereas free-text responses often included non-specific terms such as '*simple analgesia*' or '*Discussion, self-help, leaflet/advice sheet, analgesia*'. Overall, the reported use of analgesia and exercise in both the StQ and AbQ appeared to be similar but the information was more precise in the StQ (see Table 5-10).

Considering both the benefits and the disadvantages of using closed questions, the recommendation to limit or avoid open-ended questions in written surveys (255,294) and the observation that closed questions are desirable for long questionnaires and/or when motivation to answer is not high (279), the decision was taken to minimise the use of free-text responses in the main survey questionnaire. Responses that were given in multiple sections of both questionnaires (e.g. '*weight loss advice*', '*keeping active*') were converted to response options in the main survey so that this information could be collected more systematically. Risks of restraining responses should be mitigated by updating response options in line with the results from the pilot survey and through the continued use of an '*other*' option.

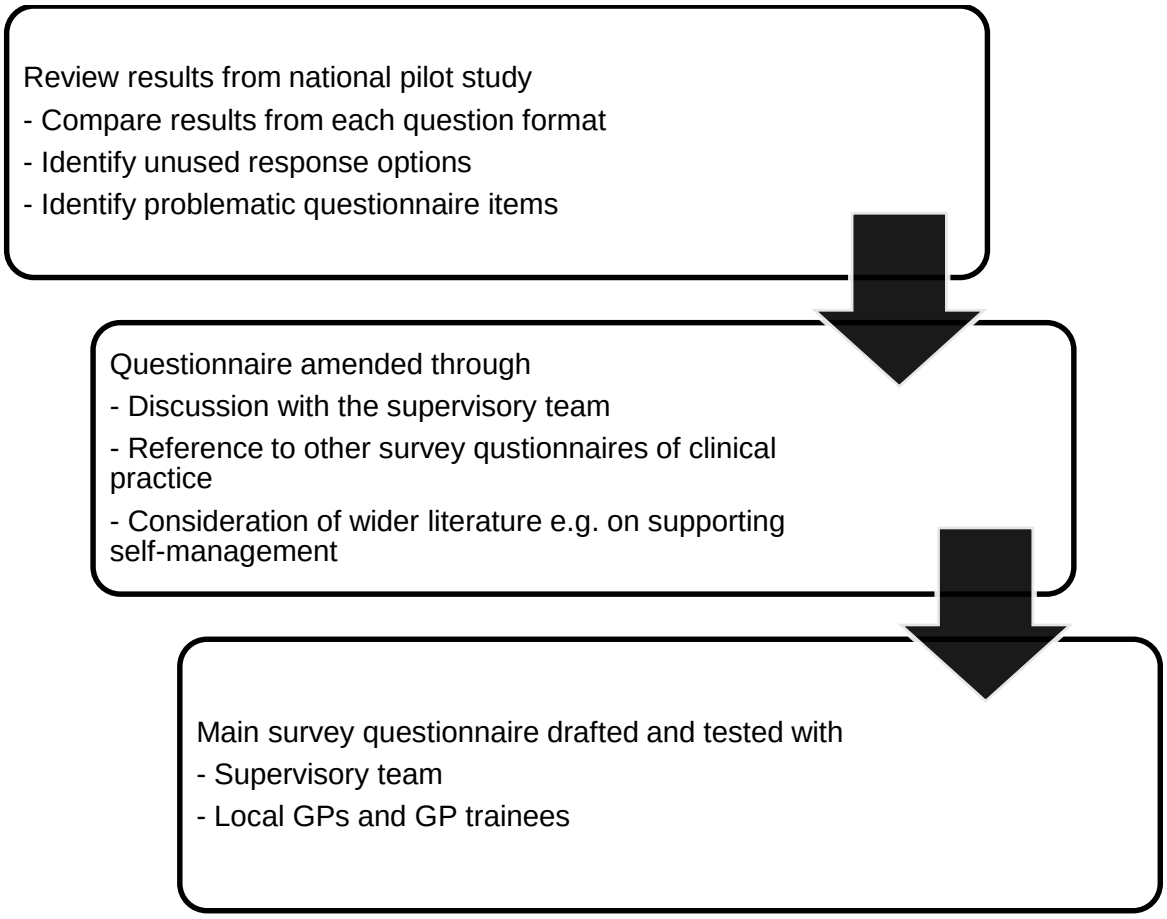
5.4.3 Use of exercise for CKP

Most (85%) GPs reported that they would use exercise for the vignette patient. Respondents reported using general exercise more frequently than quadriceps strengthening exercises. Only a minority of GPs (31%) reported using both local and general exercises, behaviours in line with evidence-based recommendations. This result was contrary to the results from physiotherapists in the ABC-Knee study who more frequently recommended local strengthening exercises (174). In the main survey, the use of exercise was going to be established using a closed question, therefore the estimated frequency of exercise use included in the main survey sample size calculation was the proportion of GPs who responded that they would use exercise of any type when asked using the closed question in the StQ; this figure was 85%. A detailed discussion of the attitudes, beliefs and behaviours of GPs regarding the use of exercise for CKP is provided in the next chapter based on the results from the main survey.

5.4.4 Finalisation of the main survey tool

The results of the pilot survey provided sufficient data to finalise the survey tool, the method and the sample size for the main survey. The approach taken to finalise the questionnaire survey tool is summarised in Figure 5-4.

Figure 5-4 Summary of the stages of finalisation of the main survey tool



The final main survey tool (see Appendix 20) was eight pages long and had five main sections:

1. Demographics (‘About you’)
2. Behaviours of GPs determined by management of a case vignette (‘Clinical scenario of a patient with chronic knee pain)
3. Attitudes and beliefs about, and barriers towards, managing CKP in general practice (‘Chronic knee pain in general practice’)
4. Attitudes and beliefs about CKP in general (‘Your views about chronic knee pain’)
5. Attitudes and beliefs about the role of exercise in managing CKP (‘Your views about the role of exercise in treating chronic knee pain’)

Following testing by two GP trainees and two qualified GPs to establish readability, mean time for completion was calculated as 17.5 (range 12 to 20) minutes. The following sections now describe how the results of the pilot questionnaire informed the development of the final survey tool (summarised in Appendix 19). Appendix 21 summarises how the main survey tool items map onto the underpinning theoretical model.

5.4.4.1 Section 1: About you

Demographic details were generally completed with few missing data. Minor changes were made to this section to improve clarity.

5.4.4.2 Section 2: Your views about chronic knee pain

The emphasis of the item enquiring about perceived roles of GPs was changed slightly so that GPs were asked what they believed their own role to be, rather than GPs' role in general. The adapted PABS_PT was amended to maximise consistency with the original tool. This section was repositioned so it followed the vignette-based questions to prevent these items influencing GPs' reported behaviours.

5.4.4.3 Section 3: Clinical scenario of a patient with chronic knee pain

There were no significant issues raised with the vignette from the pilot survey responses and therefore no changes were made; appropriate diagnoses were given and no-one suggested a diagnosis (e.g. septic arthritis or malignancy) for which exercise would be an inappropriate primary management strategy. Where diagnoses could not be given this was often due to the GPs desire to establish results of investigations or response to treatment, rather than uncertainties or confusion arising from the vignette itself. The response options for the item which

enquired about investigations of the vignette patient were reduced to maintain brevity while requesting additional information on the rationale for selecting each. The wording of the item enquiring about referrals was amended to encourage GPs to consider referrals in the context of both community services (e.g. physiotherapy, weight loss service, exercise programme, occupational health, dietetics) and secondary care referrals (e.g. rheumatology or orthopaedics). Response options pertaining to the management of the vignette patient were refined in light of the responses given within the pilot survey. The information obtained from the section asking about further details of the exercise used was of limited value (many GPs responded with statements relating to '*keeping active*') and the heterogeneity of responses was burdensome for data coding. This section was therefore substantially amended to focus better on what GPs actually do. In the pilot StQ GPs were asked to provide information on the '*kind of exercise*' they would suggest to the vignette patient and the advice they would give regarding exercise. To address the problem of insufficiently focused responses from these open questions and the lack of clarity about exactly what GPs do when initiating exercise with a patient who has CKP, the revised section for the main study broke this information down into general exercise, local exercise and follow-up and asked for specific information about how they would use each strategy. For GPs who would like to use certain types of exercise but feel they cannot do so, an area was provided to enable them to indicate why this was the case.

5.4.4.4 Section 4: Your views about the role of exercise in treating chronic knee pain

No changes were made to the MOVE consensus-derived attitude statements or the additional questions enquiring about potential barriers to GPs using exercise.

However the open question which asked GPs '*what do you feel is your role as a GP in exercise as a treatment for CKP?*' was problematic as it did not adequately or accurately capture the GPs' beliefs about their role specifically regarding the initiation of exercise for patients with CKP. This item was restructured into two closed questions to gather specific information about GPs' perceptions about: 1) their roles in initiating exercise, and 2) barriers experienced while trying to use exercise. Response options provided for these items were based on the pilot results.

5.4.4.5 Section 5: Guidelines

Some GPs from Scotland commented that they use SIGN, rather than NICE, guidelines. However because no SIGN guidelines existed regarding the management of CKP, continued reference to NICE guidelines was deemed to be appropriate for a UK GP population. However data obtained from items relating to attitudes about the NICE guidelines in general added little value overall and may prompt further feedback from main survey respondents about the applicability of NICE guidelines in Scotland. For the sake of brevity, items relating to perceptions of NICE guidelines as a tool to inform clinical practice were removed from the main survey tool.

5.4.5 Strengths and limitations of the pilot survey

A strength of this pilot is that the sample used was as close a match as possible to the main survey sample (279,366). Given the small sample, exploratory analysis of the pilot data could not provide definitive answers to the main survey questions, however analysis of pilot data enabled evaluation of the value of individual survey items. The variables that may impact GP survey response (i.e. questionnaire length

and the offer of an incentive) were investigated using questionnaires sent at the same point in time and using the same clinical topic. This is important given that response to questionnaires can be impacted by level of interest the target population has in the topic (256,257,359) which may vary over time. Few differences were identified in the characteristics between responders and those providing only MDS. However, a limitation is the lack of any information about those GPs who did not respond at all. Therefore the degree and likely influence of response bias was incompletely ascertained. While calculation of percentage difference in response obtained from the different questionnaires being tested, and the associated CI, is an accepted analysis approach for a pilot study, the use of statistical tests in the context of a pilot survey has limitations (367). In this pilot survey, these particularly relate to the inaccuracies that may be introduced by the lack of power calculations undertaken to establish the required sample size (367) and the risk that the sample may have been too small to precisely detect any true difference in response relating to the questionnaire type. An alternative approach to assess the impact of using the different questionnaire types on response would be to use a pre-determined minimum important difference in response (368). However, given that definitions of questionnaire length are heterogeneous (e.g. number of words, pages, items or time taken for completion) (257) and response to GP surveys is variable but often low, and is impacted by a number of factors including interest and topic (256,257,339), establishing *a priori* a minimum important difference would have also had its own limitations and potential inaccuracies. With this in mind, the results relating to differences in response according to questionnaire type must be interpreted with some caution (367). A potential confounder for the impact of questionnaire length on response was the use of a different question format to enquire about the

investigation and management of the vignette patient in the two questionnaires. For these two items, closed questions were used in the StQ and open questions in the AbQ. Although use of open questions can significantly reduce response compared to closed questions in more general populations (257), the impact of question format among GPs is unknown. Further, this difference only affected two out of 85 items in the StQ and 36 items in the AbQ and these items were positioned partway through the questionnaire, therefore it is unlikely that the format of these two items will have significantly altered the GPs' decision to respond. The confounding effect of the question format was balanced in the assessment of the impact of response according to offer of incentive as half of both the groups receiving the StQ and AbQ was offered the incentive.

5.5 Conclusions

The pilot survey was undertaken to inform the main survey through obtaining information to calculate the required sample size (discussed in the next chapter, Section 6.2.3) and to finalise the main survey tool and method. Results from the pilot highlighted features of the survey method that were useful in promoting response (e.g. reminder mailings) and those that were not (e.g. shorter questionnaires and a prize draw incentive). Therefore, an alternative, electronic response option was considered for promoting response to the main survey (see Section 6.2.1). Much of the survey tool worked well, as there were few missing data and the vignette was interpreted appropriately. Problematic questionnaire items were detected through ambiguous responses, missing data and inadequate understanding of the exact behaviours of GPs when initiating exercise in the management plan of a patient with CKP. Consequently, changes to the survey tool

were made and one section, investigating the GPs' exact use of exercise, required more substantial redevelopment. The next chapter describes the main survey and its results.

6 GPs' attitudes, beliefs and behaviours regarding exercise for chronic knee pain: a national questionnaire survey

The fourth, and final, objective of this PhD was to investigate the attitudes, beliefs and behaviours of GPs regarding the management of, and specifically the use of exercise for, CKP. This chapter describes how this objective was met through undertaking and reporting the results obtained from the national survey before discussing how these fit with the underpinning model and the results of other similar work.

6.1 Aims and objectives of survey

As outlined in Section 1.7, the overall aim of the PhD is to investigate the attitudes, beliefs and behaviours of GPs regarding exercise for CKP. This was achieved using a national cross-sectional GP questionnaire survey. The specific aims of this main survey were to:

- Directly investigate the attitudes and corresponding behaviours of GPs regarding exercise for CKP
- Identify barriers to the use of exercise for CKP in the clinical setting
- Explicitly identify GPs' perceptions of their role with regards to initiating exercise for CKP
- Establish the value of the adapted PABS_PT in the context of measuring GPs' attitudes about CKP
- Ascertain whether providing an online electronic response option increases levels of response in a postal questionnaire survey.

6.2 Methods

As described in Section 5.4.4, a single, eight-page survey tool was finalised for the main survey. Because length and provision of an incentive did not improve response to the pilot survey, an alternative strategy, an electronic response option, was considered to optimise response through reduced burden to GPs of completing and returning the questionnaire. This is now described.

6.2.1 Electronic survey response option

In the time between undertaking the pilot and main surveys, a postal questionnaire survey of 5000 GPs which included an electronic response option was undertaken in the RIPCHS to study GP management of PMR (358). In addition to 23% of GPs responding by post, 3% responded using the electronic link (358). Providing an electronic link with a paper questionnaire overcame the issue of email databases being less comprehensive than postal databases (see Section 4.1.2) while potentially reducing the burden of completion and return. However, it was unknown whether those who used the electronic link were additional responders or would have otherwise responded by post. To test this, and to try to maximise response for the main survey, an electronic response option was included in the current main survey. The item '*Would you have completed and returned the paper version of the questionnaire if this electronic response option was not available?*' was added to the end of the electronic survey to establish its value. To conform to the electronic questionnaire survey software, minor amendments to the format of some questionnaire items had to be made; otherwise the content of the paper and electronic surveys (Appendix 22) was identical.

6.2.2 Ethical approval processes

Prior to obtaining ethical approval the project went through a process of external peer review. Ethical approval was sought and gained from the Keele University Ethical Review Panel and NHS R&D approved the study without any further amendments. Following study commencement, a substantial amendment was approved to extend the deadline for data collection (see Section 6.2.4.1) and to allow comparison of deprivation status of respondents versus non-respondents using deprivation scores derived from postcodes (see Section 6.2.5.4). While the postcodes of the whole sample were already on the mailing database, the original ethical approval had not included analysis of deprivation scores nor to compare non-responders with responders. See Appendix 23 for copies of all the approval letters for the main survey.

6.2.3 Population and sample

The required sample size was initially based upon the primary outcome, which was the proportion of GPs reporting to use exercise, of any type, in the management of CKP. This was estimated using the proportion of GPs who actually ticked general exercise and/or quadriceps strengthening exercise as a management option in the pilot StQ3.8 (85%). As prevalence figures close to 50% require larger sample sizes to give narrow CIs (369), a conservative estimate of 75% was used for the sample size calculation. Using this conservative estimate (p), a margin of error (e) of <5%, and the formula ((1.96*1.96)*(p*(1-p)))/(e*e) (370) a minimum of 288 responses was required.

Because one of the aims of this survey was to establish the value of the adapted PABS_PT when used by GPs in the context of CKP, the sample size was adjusted

to accommodate regression analyses to investigate the association between GPs' treatment orientation and their use of exercise. In the absence of a validated method for interpreting adapted PABS_PT subscale scores, two approaches were considered; to treat the scores as continuous or to categorise scores. The former approach was rejected as an meaningful difference in adapted PABS_PT scores is unknown; that is, it is not known whether a GP with a difference in subscale scores of, for example, 1, 2, 5 or 10 points is related to a (incremental) change in behaviour. The alternative method, categorising the scores using an arbitrary definition (e.g. high or low) could be performed using scores falling above or below the median value (371) or using scores in the upper and lower quartiles. Anticipating that scores may cluster around the median, categorising the adapted PABS_PT scores using median values was rejected. Therefore, anticipating greater differences in exercise use between those with more polarised treatment orientations, the method chosen was to categorise adapted PABS_PT subscale scores as high/low defined by the upper/lower quartiles. Using a margin of error of 5% and a power of 90%, to detect an estimated difference in the use of exercise of 15%, a sample size of 748 would be required (372). To accommodate possible inaccuracies in the estimations used in the calculation, a target minimum of 1000 responses was set. With a conservative expected response of 20%, based on the 22% response achieved in the pilot, the sample size to mail was calculated to be 5000 GPs.

A simple random sample of GPs working in the UK was obtained from Binley's database. This database held details of 46,147 qualified GPs on 29th November 2013 (personal correspondence). The sample was checked by Binley's against the pilot survey sample to ensure that duplicates were removed and replaced.

6.2.4 Undertaking the questionnaire mailing

6.2.4.1 Mailing timetable

On 15th January 2014, all 5000 UK GPs were mailed a study pack containing a covering letter (Appendix 24) the study questionnaire labelled with a unique identification (ID) number, printed on white standard weight paper (80g/m^2) and a pre-paid envelope. GPs were informed that they could complete an online version of the questionnaire on the front of the paper questionnaire and within the cover letter. The first reminder mailing was sent to non-responders after two weeks (29th January 2014) and consisted of a postcard (Appendix 25) reminding GPs of the aims of the study, signposting them to the online version of the questionnaire and requesting a MDS from those who did not wish to respond to the full questionnaire. Postcards, labelled with survey ID numbers, were pre-printed on yellow card with a return address and return postage paid and were sent in an envelope. The second reminder mailing was sent to non-responding GPs after a further two weeks (12th February 2014) and included a second copy of the original questionnaire, a reminder cover letter (Appendix 26) and a pre-paid envelope. Again, GPs were signposted to the online version on the front of the questionnaire and in the follow-up cover letter. GPs were advised of a closing date for questionnaire returns of 12th March 2014, eight weeks after the baseline mailing. However, after obtaining approval from Keele University Ethical Review Programme for a substantial amendment to extend the deadline for data collection, responses received up until, and including, 30th April 2014 (15 weeks after the baseline mailing) were included in the analysis. The mailing database was maintained according to the procedure described for the pilot.

6.2.4.2 Obtaining consent from participants

In line with the pilot survey, completion and return of the main survey questionnaire was taken to imply the GP's consent to participate in the study.

6.2.5 Data management

6.2.5.1 Data input

Upon receipt of returned study documentation, response type and, if provided, reason for non-response, were inputted into the mailing database by administrative staff. Results from completed questionnaires and MDS, associated only with the unique survey ID, rather than personal details, were inputted into a database using Microsoft Access 2010. Responses from the electronic questionnaire survey were exported as text answers and re-coded to match the numerical coding assigned to the paper questionnaire results. Missing values were coded in the same standardised way as explained for the pilot.

6.2.5.2 Data checking

The mailing database was checked against the returned questionnaires and MDS throughout the study period to detect and correct inaccuracies. Once data entry was complete, the mailing and results databases were cross-checked to ensure the nature of responses (i.e. full questionnaire, MDS, exclusion, WD and non-responders) were completely and correctly recorded. The accuracy and consistency of raw data entry was checked by administrative staff who selected one in ten questionnaires (n=86) for checking. Coding of all items on each questionnaire selected was cross-checked with the actual responses given to ensure they were equivalent (overall item error rate = 0.037%).

6.2.5.3 Analysis and coding of free-text responses

Free-text responses were managed according to the approach used in the pilot (see Section 5.2.8.3); using Braun and Clarke's six stages of thematic analysis (353). However, phase two (generating initial codes) was initially informed by the final coding from the pilot questionnaire. Novel concepts were extracted and, where needed, new themes were developed in phase 3 (searching for themes). Phase 4 (reviewing themes) was undertaken, again, by circulation among the supervisory team and subsequent refinement of the grouping and coding. At this stage, the proposed themes were compared against the raw data to ensure that concepts and associated themes continued to represent the data. Once this checking had been completed and agreement of groupings and themes had been achieved, the themes were named (phase 5) and the dataset coding was updated to reflect the final themes. As per the pilot data analysis, the use of an '*other*' theme for free-text items ensured all concepts were coded and recognised comprehensively during analysis. Appendix 27 illustrates the final agreed themes with associated concepts and responses for all items which elicited free text. Examples of responses relating to diagnosis (Table 6-5), description of diagnosis (Table 6-17) and the future are provided next to the relevant codes (Section 6.3.6.1). However, given the rich nature of free-text responses relating to barriers to exercise use, a greater level of detail of the themes, codes and responses is provided in Section 6.3.5 alongside the quantitative results.

6.2.5.4 Data cleaning

Following completion of coding, data were examined using frequency tables to ensure thorough coding of missing data and checking for data coded outside of

acceptable ranges. Mutually exclusive responses were cross-tabulated to detect double-coding. Where anomalies were noted, coding was amended by referring to the original data.

Despite requesting one primary reason for declining to complete a full questionnaire, some GPs provided with multiple reasons. All responses were coded. As per the pilot survey, any responses provided in inappropriate sections of the questionnaire were re-coded under the most appropriate item; see Appendix 28. Prior to anonymisation of the mailing dataset, GPs' practice postcodes were transformed into deprivation scores which were calculated separately for each country and split into quintiles (1=most deprived, 5=least deprived).

6.2.5.5 Data analysis

Data analysis was primarily undertaken by the author of this thesis with support from a biostatistician. The approaches used to analyse data relevant to the primary and secondary research questions are described below and this information is summarised in Appendix 29.

Primary questions

Use of exercise for CKP

Descriptive statistics were used to describe the diagnoses given to the vignette patient, the proportion of GPs who reported that they would use exercise in the management of the vignette patient and, among those who used exercise, the means by which this was done. Key factors associated with the use of exercise were assessed. Factors that were decided *a priori* are summarised in Appendix 29. Further factors were decided *a posteriori* once heterogeneity of responses to the items was established, to ensure comprehensive testing of the elements of the

underpinning theoretical model described in Chapter 2 and to better understand the results observed. These factors included: reported experience of specific barriers to the use of exercise, GPs' beliefs about their role in incorporating exercise into a management plan of a patient with CKP and responses to individual MOVE consensus-derived attitude statements. Associations between GPs' use of exercise and predictor variables were examined using logistic regression analyses and expressed as odds ratios (OR) and 95% CI (373).

A further *a posteriori* analysis was undertaken due to the timing of the main survey coinciding with publication of the revised version of the NICE OA guidelines on 12th February 2014 (four weeks after the baseline mailing of the survey). To establish whether the publication of these guidelines, and the publicity associated with this event had an impact on the proportion of GPs using exercise, logistic regression analysis was used to compare the use of exercise among responses received before 12th February 2014 with those responses received on or after 12th February 2014.

Attitudes about exercise for CKP

Attitudes about CKP in general were assessed by calculating adapted PABS_PT subscale scores. Although providing the relevant denominator to illustrate the extent of missing data was appropriate for most questionnaire items, missingness was problematic when calculating the adapted PABS_PT subscale scores as it may reduce the power to detect a difference in treatment orientation between GPs using and not using exercise. Therefore, when responses to individual items within the adapted PABS_PT were reported, complete case analysis was performed, however,

when subscale scores were required, missing data were dealt with in the following ways (296):

1. When ≤1 value was missing from a subscale, the missing item was imputed from the mean score of all the other items in that subscale
2. When >1 value from a subscale was missing, the whole subscale was classed as missing

Descriptive analyses were undertaken for attitude statements relating to risk factors for CKP and, following thematic analysis (Appendix 27), beliefs about prognosis. Responses to MOVE consensus-derived attitude statements, pertaining to attitudes about exercise for CKP, were condensed into three categories: (strongly) disagree, neither disagree nor agree, and (strongly) agree. Responses were interpreted according to unamity = 100%, consensus = 75-99%, majority view = 51-74% and no consensus = 0-50% (175,355). Responses to the statement, '*exercises that may be knee straining should not be avoided*' were analysed in a similar way, by dividing responses into (totally or largely) disagree, ambivalent (agree/disagree to some extent) or (totally or largely) agree. To determine the extent to which GPs attitudes and beliefs about exercise were in line with evidence-based recommendations, six of the MOVE consensus-derived attitude statements were selected; Table 6-1 provides the rationale selecting these items (further detail is given in Table XXIX-B in Appendix 29). Responses were classified as '*in line*' with treatment recommendations if GPs strongly agreed with all six attitude statements, '*broadly in line*' with treatment recommendations if GPs agreed with all six attitude statements (but did not strongly agree to all of them) or '*not in line*' with treatment

recommendations if GPs did not (strongly) agree with at least one of the attitude statements.

Secondary questions

Secondary questions for this study are summarised in Appendix 29. Briefly, descriptive analyses were undertaken to describe GPs' reported barriers experienced which have prevented the use of exercise for patients with CKP and their beliefs about their role in initiating exercise for CKP. The value of the adapted PABS_PT was assessed by considering the extent of missing data and the frequency of ambivalent ('*disagree to some extent*', '*agree to some extent*') responses. The relationship between biomedical and behavioural treatment orientation scores was examined and, using logistic regression, the association of the use of exercise with adapted PABS_PT treatment orientation scores was assessed. Finally, the relationship between the GPs' treatment orientation on each subscale and the extent to which the GPs' reported attitudes were in line with exercise recommendations was assessed using a one-way analysis of variance (ANOVA), to compare the mean subscale scores between the three different categories described in the previous section. Finally, the impact of providing an online electronic response option was assessed by calculating the percentage difference in response to the pilot and the main survey, and descriptive analyses of negative responses to '*Would you have completed and returned the paper version of the questionnaire if this electronic response option was not available?*'.

Table 6-1 Rationale for selection of MOVE consensus attitude statements for assessing the extent to which GPs attitudes and beliefs about exercise were in line with evidence-based recommendations

Attitude statement	Rational for selection
GPs should prescribe quadriceps strengthening exercises to every patient with CKP **GPs should prescribe general exercise, for example, walking or swimming, for every patient with CKP**	MOVE consensus recommendations highlighted category 4 evidence for the statement 'Prescription of both general and local exercises is an essential, core aspect of management for every patient with...knee OA' (50). Quadriceps strengthening exercises and general exercises are part of core treatment in current NICE guidelines (2). To be in line with best evidence recommendations, both local and general exercises should be included to maximise positive outcomes (8).
Knee problems are improved by quadriceps strengthening exercises **Knee problems are improved by general exercise, for example, walking or swimming**	MOVE consensus recommendations highlighted that there was category 1B evidence to support the statement 'Both strengthening and aerobic exercise can reduce pain and improve function and health status' in patient with knee OA (50). NICE guidelines recommend local and general exercises as core management approaches as they improve 'general motility, function, well-being and self-efficacy' (2). Effect sizes for local and general exercises are outlined in Table 1.4.
Quadriceps strengthening exercises for the knee are safe for everybody to do **General exercise, for example, walking or swimming, is safe for everybody to do**	MOVE consensus recommendations highlighted that there was category 4 evidence that there are few contraindications to exercise (50). Studies examining the safety of long term exercise for knee pain have concluded that exercise appears to be safe in this group (63,64)

Category 1B = At least one randomised controlled trial; Category 4 = Expert committee reports/opinions and/or clinical opinion of respected authorities. CKP = chronic knee pain; GPs = general practitioners; NICE = National Institute for Health and Care Excellence; OA = osteoarthritis

To elicit the reasons why GPs declined to participate (or who contacted the research team to WD) or responded only with an MDS, multiple response options were provided. However, many GPs also provided free-text comments. It was decided *a posteriori* to analyse these free-text responses to gain a richer understanding of why GPs had not responded to the questionnaire.

Software used for analyses

Data cleaning and descriptive, Chi-squared, logistic regression and one-way ANOVA analyses were performed using IBM SPSS Statistics (Version 20). Calculation of CI for percentage difference was undertaken using Microsoft Excel (2010).

6.3 Results

Presentation of the results of the survey starts by detailing the response to the questionnaire, comparing the demographic characteristics of respondents versus non-respondents and the value of including the electronic response option. This is followed by presentation of results pertaining to the primary aims of the study, the attitudes, beliefs and behaviours of the GPs and the factors associated with the use of exercise, for which the results are mapped onto the underpinning model (described in Chapter 2).

6.3.1 Response

Of the 5000 UK GPs sent the questionnaire, 58 questionnaires were returned indicating the recipient met the exclusion criteria. Of the remaining 4942 eligible GPs, 835 (adjusted response 17%) GPs returned a completed questionnaire. Of all

responders, 47 (6%) responded using the electronic version. Forty-four GPs responded to the question asking whether they would have returned the paper version of the questionnaire in the absence of the electronic version, of which 19 (43%) stated they would not. Response to the main survey was significantly lower than that of the pilot survey (% difference -5% (95% CI -2%, -8%).

An additional, 470 GPs (10%) responded with a MDS. The most common reason given for returning MDS was too little time (n=408, 87%, see Table XXX-A in Appendix 30). This was also the most common reason for GPs to withdraw from the survey (n=94, 38%, see Table XXX-B in Appendix 30). Additional reasons for non-participation identified from free-text comments from GPs who WD or returned MDS were imminent retirement (n=7), unable to complete it at the time (n=3), too much like an exam (n=2, one of whom also said '*there are not enough hours in the day for this sort of thing*'), inadequate knowledge about CKP (n=2), did not understand the questionnaire (n=1), objection to '*profiling*' [demographic] questions (n=1, in addition to lack of remuneration), the adapted PABS_PT and MOVE attitude statements (n=1) and the belief that '*the results of these studies are frequently used to undermine our patients*' confidence in GPs' (n=1).

The spread of deprivation scores for each country and across the sample were similar (see Table 6-2); therefore the data were analysed according to quintiles defined by the national spread. When compared to GPs with practice postcodes in the mid-deprived quintile (OR (95% CI)), those in the most deprived (0.72 (0.60,0.87)) and second most deprived (0.76 (0.62,0.92)) were significantly less likely to respond in any way, although the absolute difference in the proportions responding are quite small (see Table 6-3). As deprivation scores are not directly

comparable between countries (374) by-country data are supplied in Table XXX-C in Appendix 30.

Table 6-2 Details of deprivation indices used for each country

Country	Index of deprivation used	National deprivation score quintiles*	n	Spread of scores in sample
England	English Indices of Deprivation 2010 (375)	Q1 = 1, 6496 Q2 = 6497, 12993 Q3 = 12994, 19489 Q4 = 19490, 25986 Q5 = 25987, 32482	4050	6, 32481
Scotland	Scottish Index of Multiple Deprivation (376)	Q1 = 1, 1301 Q2 = 1302, 2602 Q3 = 2603, 3903 Q4 = 3904, 5204 Q5 = 5205, 6505	499	30, 6505
Wales	Welsh Index of Multiple Deprivation (377)	Q1 = 1, 382 Q2 = 383, 764 Q3 = 765, 1145 Q4 = 1146, 1527 Q5 = 1528, 1909	226	25, 1905
Northern Ireland	Northern Ireland Multiple Deprivation Measure (378)	Q1 = 1, 178 Q2 = 179, 356 Q3 = 357, 534 Q4 = 535, 712 Q5 = 713, 890	158	5, 887

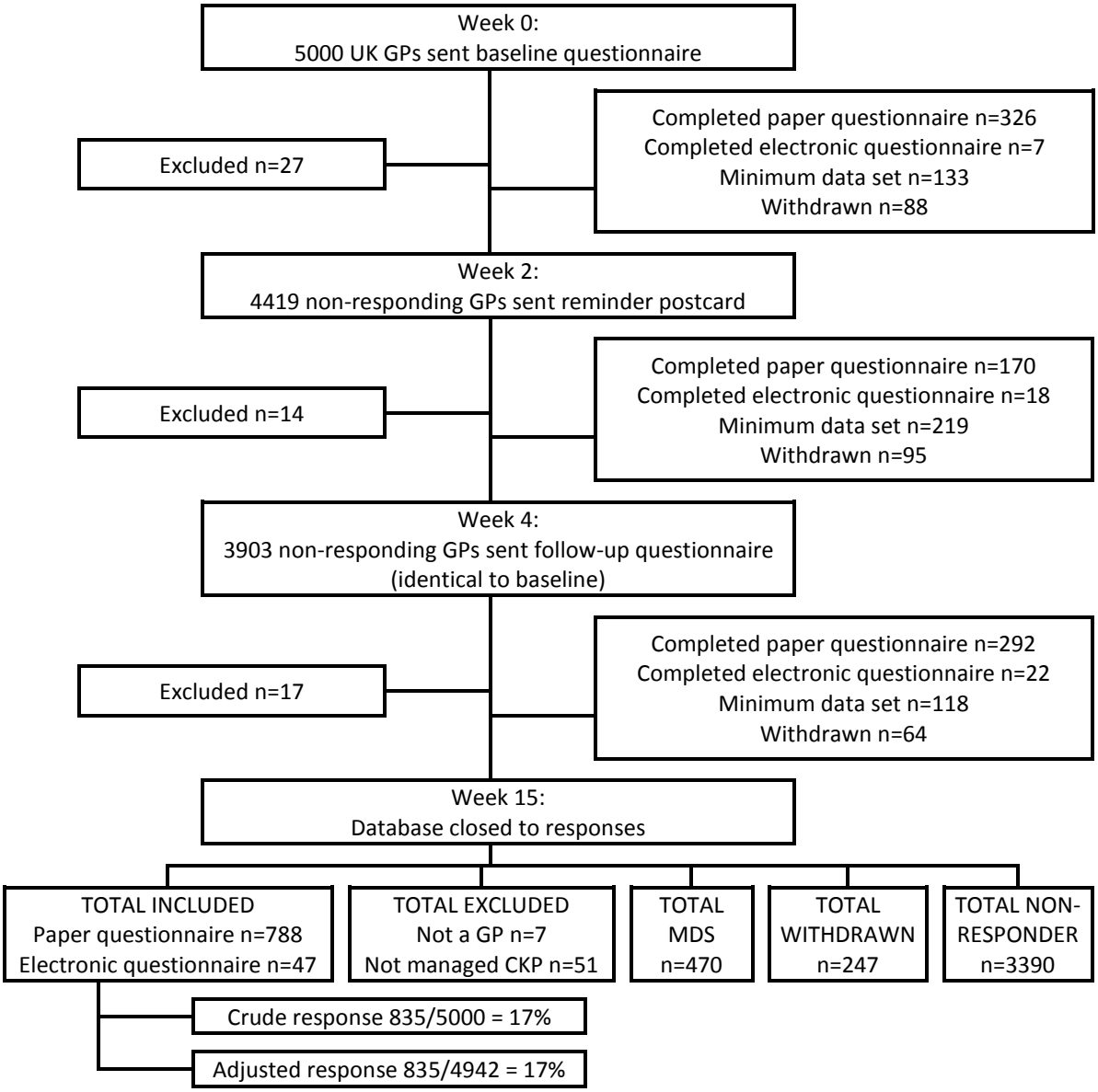
Q1 = quintile 1 (most deprived); Q2 = quintile 2; Q3 = quintile 3; Q4 = quintile 4; Q5 = quintile 5 (least deprived)

Table 6-3 Deprivation scores of responding GPs' practices versus non-responders

Response*		No (%) (n=3630)	Yes (%) (n=1303)	OR for responding (95% CI)
Practice area deprivation**	Most deprived	964 (27%)	302 (23%)	**0.72 (0.60,0.87)**
	Second most deprived	798 (22%)	262 (20%)	**0.76 (0.62,0.92)**
	Mid-deprived	662 (18%)	287 (22%)	1.00
	Second least deprived	639 (18%)	244 (19%)	0.88 (0.72,1.08)
	Least deprived	567 (16%)	208 (16%)	0.85 (0.69,1.05)

*Response: No = non-responder or withdrawal, Yes = responded with full questionnaire or minimum data.
Quintiles for each country not directly comparable (by-country data in Appendix 30)**

Figure 6-1 Flowchart detailing responses to the questionnaire



Demographic characteristics of those who responded with a completed questionnaire were compared with those responding with MDS. All characteristics were similar apart from GPs responding with a completed questionnaire had been qualified for a shorter time on average than those providing MDS (18.4 vs. 21.6 years) and, GPs were significantly less likely to respond with a completed questionnaire if their practice postcode was in the most or second-most deprived quintiles (see Table 6-4).

Table 6-4 Demographic details of MDS versus questionnaire respondents

Variable	Category	Response type		Test of statistically significant difference
		MDS (n=470)	Completed questionnaire (n=835)	
Gender	Female	219 (47%)	417 (51%)	Pearson Chi-squared = 1.883, df 1, p=0.170
Practice area deprivation*	Most deprived	121 (26%)	181 (22%)	**OR 0.63 (0.45,0.89)**
	Second most deprived	106 (23%)	156 (19%)	**OR 0.62 (0.44,0.88)**
	Mid-deprived	85 (18%)	202 (24%)	OR 1.00
	Second least deprived	84 (18%)	160 (19%)	OR 0.80 (0.56,1.16)
	Least deprived	73 (16%)	135 (16%)	OR 0.78 (0.53,1.14)
Practice type	Urban	254 (56%)	449 (54%)	Pearson Chi-squared = 2.501, df 2, p=0.286
	Semi-rural	155 (34%)	275 (33%)	
	Rural	43 (10%)	103 (13%)	
Mean (SD) years since qualification		21.6 (10.0)	18.4 (10.3)	Mean difference = -3.2 **(p<0.001)**
Mean (SD) no of GPs in respondent's practice		6.4 (3.7)	6.4 (3.2)	Mean difference = <0.1 (p=0.982)
Information only requested in questionnaire				
Type of GP	GP partner	---	656 (79%)	
	Salaried GP	---	151 (18%)	
	Locum GP	---	20 (2%)	
	Other	---	5 (1%)	
GP with special interest in musculoskeletal conditions		---	50 (6%)	
Received postgraduate education which contained education about CKP		---	319 (39%)	
Personal experience of CKP		----	166 (20%)	

*Quintiles for each country not directly comparable (by-country data in Table XXX-D in Appendix 30); Maximum missing data for any item was 6%

6.3.2 The diagnosis given to the vignette patient

Most GPs (n=833, >99%) responded to this item, of whom, two stated they would not give a diagnosis at this stage. Osteoarthritis was the most frequent diagnosis given (n=807, 97%). Wear and tear was only given as the diagnosis by ten (1%) GPs (see Table 6-5 for a summary of all diagnostic terms used by respondents). A degree of uncertainty ('*presumed*', '*probably*', '*likely*' or '*suspected*') was communicated by 227 (28%) of GPs diagnosing OA and two (20%) of those diagnosing wear and tear.

Table 6-5 Diagnostic terms given to the vignette patient

Theme	Concepts	Example of coded response*	Number of respondents (%) n=833
Medical label	Osteoarthritis	"osteoarthropathy"	807 (97%)
	Obesity	"knee pain 2ry to…weight"	47 (6%)
	Patellofemoral or anterior knee pain syndrome	"chondromalacia patellae"	37 (4%)
	CKP	"functional knee pain"	24 (3%)
	Problem with the cartilage	"meniscal bruising"	19 (2%)
	Problem with the tendon	"tendonitis"	4 (<1%)
	Possible inflammatory arthritis	"could be other form of arthritis e.g. RA"	7 (<1%)
	Problem with the ligament	"weak external ligaments"	3 (<1%)
	Inflammation	"inflammation of the knees"	1 (<1%)
Lay label	Wear and tear	"Knee pain due to wear and tear"	10 (1%)
	Wear and repair	"Probably wear and repair"	1 (<1%)
Other	Other diagnosis given	"maltracking patella" "poor physical tone"	15 (2%)

*Excluding those that are identical to the code for the concept

6.3.3 Use of exercise in the management of CKP

Of the 835 respondents, 729 (87%) reported that they would use exercise and none reported they would use bed rest. Although 22 (3%) GPs stated they would advise the vignette patient to rest, 19 (86%) of these also suggested exercise. Most GPs (n=771, 92%) suggested the vignette patient should keep active and only thirteen (2%) GPs did not advise exercise or keeping active. The use of exercise was not significantly different among responses received after the publication of the updated NICE guidelines (273/314, 87%) when compared with those received before (456/521, 88%; OR 0.95 (0.62,1.44)).

Of the 729 GPs stating they would use exercise, 538 (74%) indicated they would use both general exercises or increasing physical activity (for brevity, general exercises) and local knee or quadriceps strengthening exercises (for brevity, local exercises). Figure 6-2 summarises the use of exercise. Of those GPs reporting that they would use exercise, just over half (n=413, 57%) would refer the patient to

physiotherapy, other destinations that were less frequently used were; exercise programme (n=37, 5%), musculoskeletal clinic (n=16, 2%), weight management service (n=14, 2%), lifestyle service (n=10, 1%), orthopaedics (n=9, 1%), occupational health (n=5, <1%) and dietician (n=5, <1%).

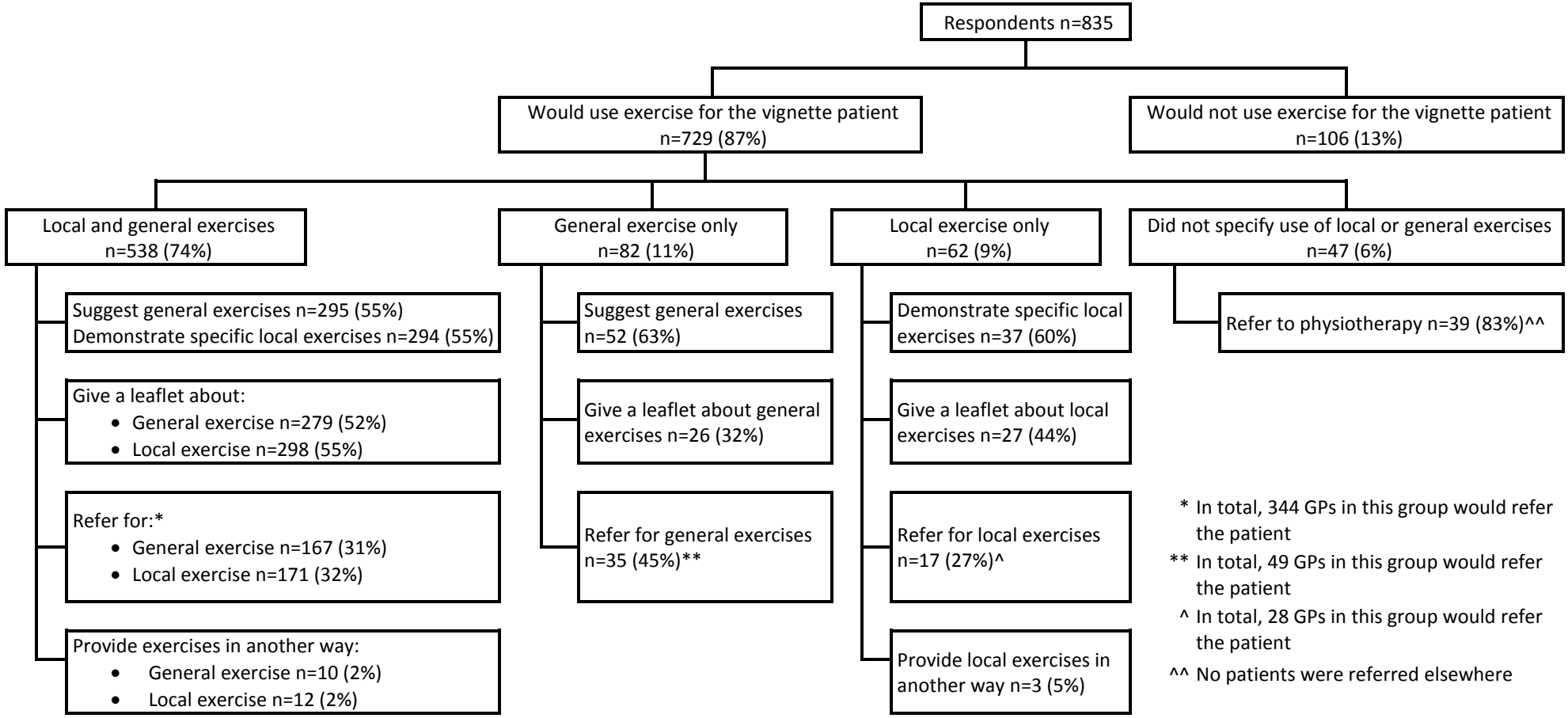
6.3.3.1 General exercise

Of the 729 GPs stating that they would use exercise, 620 (85%) reported that they would use general exercise. Methods for initiating this management were suggesting appropriate exercises (n=347, 56%), giving a leaflet (n=305, 49%) and referring the patient (n=202, 33%). Among the 347 GPs suggesting general exercises, the most common recommendations were swimming (n=170, 49%), walking (n=144, 41%) and cycling (n=118, 34%). Less specific explanations included gentle or low impact, aerobic exercise, continue activities of daily living and the gym. Seventeen GPs explicitly stated that general exercises should be tailored to patient's abilities and/or interests, see Table 6-6. Ten (2%) GPs reported that they would employ other methods to initiate general exercise: refer the patient to online resources (n=6), give explanations for this management approach (n=2), undertake a motivational interviewing approach (n=1) and one did not provide details.

Table 6-6 Suggestions for general exercise

Suggestion for general exercise	Number (%) of GPs (n=347)
Specific	
Swimming	170 (49%)
Walking	144 (41%)
Cycling	118 (34%)
Other (e.g. rowing machine, yoga)	32 (9%)
Non-specific	
Gentle or low impact	35 (10%)
Tailored to patient's abilities and/or interests	17 (5%)
Aerobic	12 (4%)
Continue activities of daily living	12 (4%)
Gym	12 (4%)
Non-weight bearing	9 (3%)
Weight bearing	4 (1%)
Increase mobility or activity	1 (<1%)

Figure 6-2 Flow-chart summarising GPs' use of exercise



6.3.3.2 Local exercise

Of the 729 GPs reporting that they would use exercise, 600 (82%) stated they would use local exercise. Methods employed to initiate local exercise included demonstrating specific local exercises (n=331, 55%), giving a leaflet (n=325, 54%) and referring the patient (n=188, 31%). Although not specifically requested, some GPs indicated the specific local exercises they would demonstrate; these included quadriceps strengthening exercises (n=99), stretches (n=5) and range-of-movement exercise (n=3). Fifteen (3%) GPs indicated they would use other approaches for including local exercises in the management of the vignette patients; signpost to online websites and videos (n=10), talk over the exercise leaflet they gave to the patient (n=1), give a general overview of exercise (n=1), recommend local body conditioning classes (n=1) and two did not provide details.

6.3.3.3 Use of exercise: fitting it all together

To better understand the use of exercise among the 538 GPs who reported that they would use both general and local exercise (74% of the GPs using exercise of any type), the methods employed to initiate exercise were summarised (Table 6-7) before being cross-tabulated (Table 6-8). Details of methods used to initiate general and local exercise were known for 535 (99%) of the 538 GPs reporting to use both types of exercise. The methods most commonly used were suggesting general or demonstrating local exercises and/or providing leaflets (Table 6-7). The combination of suggesting general exercises and demonstrating local exercises was the most frequent management strategy employed by GPs using both exercise types (13%) (Table 6-8). Ninety-two (17%) GPs used strategies in line with evidence-based

recommendations (see the area of Table 6-8 shaded green), of which the most common strategy was to suggest general exercise, demonstrate local exercise and give leaflets for both types of exercise; however this approach was only used by 8% of 535 GPs using both types of exercise. Thirty-two (6%) GPs using general and local exercise referred the patient for both.

Table 6-7 Methods used to initiate exercise by GPs using general, local and both types of exercise

Initiation of general exercises	Type of exercise used			Initiation of local exercises
	General exercises only (n=82)	General and local exercises (n=538*)	Local exercises only (n=62)	
Does not suggest, give leaflet nor refer	0%	2%	<1%	3%	**Does not demonstrate, give leaflet nor refer**
Refer only	16%	11%	16%	16%	**Refer only**
Leaflet only	16%	**23%**	**23%**	18%	**Leaflet only**
Suggest only	**33%**	**29%**	**23%**	**32%**	**Demonstrate only**
Leaflet and refer	5%	9%	6%	3%	**Leaflet and refer**
Suggest and refer	**20%**	6%	5%	5%	**Demonstrate and refer**
Suggest and leaflet	9%	15%	**21%**	19%	**Demonstrate and leaflet**
Suggest, leaflet and refer	2%	5%	6%	3%	**Demonstrate, leaflet and refer**

*n=535 for information on general exercises used; responses used by ≥20% of GPs in each column emboldened

Table 6-8 Methods used to initiate local and general exercise by GPs using both exercise types

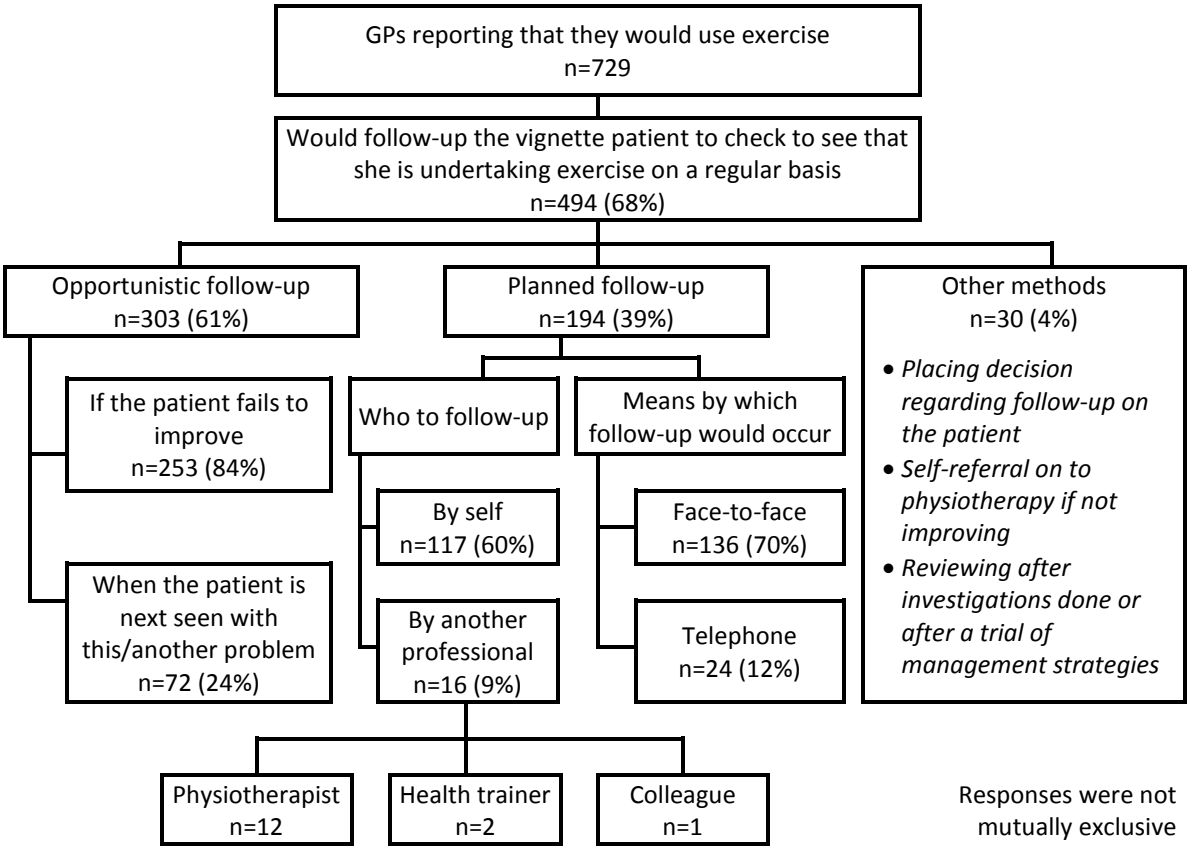
Methods used to include general exercises ↓	Methods used to include local exercises (n=535)→ Does not demonstrate, give leaflet nor refer	Refers only	Leaflet only	Demonstrate only	Demonstrate and refers	Leaflet and refers	Demonstrate and leaflet	Demonstrate, leaflet and refer
Does not suggest, give leaflet nor refer	0%	<1%	0%	<1%	0%	0%	<1%	0%
Refers only	<1%	**6%**	<1%	2%	<1%	<1%	<1%	<1%
Leaflet only	0%	1%	**11%**	2%	<1%	<1%	**7%**	1%
Suggest only	0%	5%	5%	**13%**	2%	<1%	3%	<1%
Suggest and refer	<1%	1%	<1%	2%	2%	0%	<1%	0%
Leaflet and refer	0%	<1%	1%	1%	<1%	3%	2%	2%
Suggest and leaflet	<1%	<1%	3%	2%	<1%	<1%	**8%**	<1%
Suggest, leaflet and refer	0%	<1%	1%	<1%	<1%	<1%	1%	<1%

Management strategies used by >5% GPs are emboldened. Responses highlighted in green are those which are consistent with evidence-based recommendations and the minimum expected role of GPs (i.e. providing advice and written information about both types of exercise and/or referring if needed). Responses highlighted in red are those in which patients would not be equipped to start using any type of exercise upon leaving the consultation.

6.3.3.4 Use of follow-up to check adherence with exercise

Of the 729 GPs reporting that they would use exercise, 494 (68%) stated that they would follow-up the patient to check to see if she was undertaking exercise on a regular basis. The most frequently used method was opportunistic follow-up (n=303, 61%); which most GPs envisaged would occur if the vignette patient failed to improve (n=253, 84%) (see Figure 6-3). Of the 194 (39%) who stated they would plan follow-up with the patient, the median (IQR) time to planned follow-up was 42 (28, 61) days. Of those planning follow-up, 117 (60%) stated they would do this, 16 (9%) stated that another professional would do this and the remaining GPs did not specify who would undertake this task.

Figure 6-3 Methods employed by GPs to follow-up the vignette patient to check to see if she is undertaking exercise on a regular basis



6.3.4 Attitudes of GPs towards CKP and the use of exercise for this condition

6.3.4.1 Attitudes about CKP in general: GPs' treatment orientations

The adapted PABS_PT was included to investigate GPs' attitudes regarding CKP and establish their treatment orientations. The biomedical and behavioural treatment orientation subscales scores had possible ranges of 10-60 and 9-54, respectively. Levels of consensus in response to items within to the adapted PABS_PT are given in Table 6-9 (biomedical subscale) and Table 6-10 (behavioural subscale). Subscale scores for both scales (biomedical n=810, behavioural n=813) were normally distributed. Mean (SD, range) score for the biomedical subscale was 33.3 (4.9, 17-52) and for the behavioural subscale was 34.3 (3.5, 23-45). The mean scores, ranges and levels of consensus for many items lay around the central values which may indicate uncertainty and/or ambivalence. There was no correlation between the biomedical and behavioural subscale score for each GP (Pearson's R -0.106). Free-text comments were frequently associated with the adapted PABS_PT tool and many indicated that some GPs felt items were difficult to understand (e.g. GPs annotated items with '*?*') and/or answer in general terms (e.g. GPs annotated items with '*depends*'). The adapted PABS_PT tool was also criticised for being too '*wordy*'.

Table 6-9 Level of consensus reached on adapted PABS_PT biomedical subscale items

Attitude statement n=835	Disagree*	Ambivalent response – to some extent...		Agree*
		Disagree	*Agree*	
CKP indicates the presence of organic injury	27%	*39%*	*27%*	7%
		66%		
The severity of tissue damage determines the level of pain	58%	*29%*	*11%*	3%
		40%		
Patients with CKP should preferably practise only pain free movements	37%	*44%*	*13%*	6%
		57%		
Increased pain indicates new tissue damage or the spread of existing damage	25%	*44%*	*23%*	7%
		68%		
If patients complain of pain during exercise, I worry that damage is being caused	40%	*38%*	*19%*	3%
		57%		
Pain is a nociceptive stimulus, indicating tissue damage	13%	*30%*	*43%*	14%
		73%		
Pain reduction is a precondition for the restoration of normal functioning	12%	*29%*	*36%*	24%
		65%		
If therapy does not result in a reduction in CKP, there is a high risk of severe restrictions in the long term	12%	26%	38%	24%
		64%		
If CKP increases in severity, I immediately adjust the intensity of my treatment accordingly	7%	*30%*	*41%*	23%
		71%		
In the long run, patients with CKP have a higher risk of developing severe functional impairments	4%	*15%*	*47%*	34%
		62%		

*Totally and largely. Consensus categorised according to: unamity = 100% (red), consensus = 75-99% (orange), majority view = 51-74% (yellow), no consensus = 0-50% (blue). CKP = chronic knee pain. Maximum missing data for any item was 3%

Table 6-10 Level of consensus reached on adapted PABS_PT behavioural subscale items

Attitude statement n=835	Disagree*	Ambivalent response – to some extent...		Agree*
		Disagree	*Agree*	
The cause of chronic knee problems is unknown	35%	*35%*	*27%*	3%
		62%		
There is no effective treatment to eliminate chronic knee problems	52%	*28%*	*15%*	6%
		42%		
Functional limitations associated with chronic knee problems are the result of psychosocial factors	9%	*20%*	*54%*	17%
		74%		
Even if the pain has worsened, the intensity of the next treatment can be increased	10%	*39%*	*38%*	13%
		77%		
Exercises that may be knee straining should not be avoided	13%	*27%*	*40%*	21%
		67%		
Mental stress can cause chronic knee problems even in the absence of tissue damage	10%	*13%*	*55%*	22%
		68%		
Therapy may have been successful even if pain remains	4%	*8%*	*48%*	40%
		56%		
Learning to cope with stress promotes recovery from chronic knee problems	2%	*3%*	*45%*	51%
		47%		
A patient suffering from a severe chronic knee problem will benefit from physical exercise	1%	*2%*	*27%*	70%
		29%		

* Totally and largely. Consensus categorised according to: unamity = 100% (red), consensus = 75-99% (orange), majority view = 51-74% (yellow), no consensus = 0-50% (blue). Maximum missing data for any item was 5%.

6.3.4.2 Attitudes about exercise for CKP

Of 804 GPs responding to the item, only 166 (21%) GPs (totally or largely) agreed that exercises that may be knee straining should not be avoided. However, among 825 GPs responding to the item, 581 (70%) GPs (totally or largely) agreed that a patient suffering from a severe chronic knee problem will benefit from physical exercise Table 6-10. No MOVE consensus-derived attitude statements elicited a unanimous response (Table 6-12). Generally, GPs were more positive about general exercise than local exercise. An exception was that more GPs agreed that increasing the strength of the muscles around the knee stops the knee problem

getting worse (55%) compared with those agreeing that increasing overall activity would do the same (43%). GPs recognised the need to tailor exercises to individual patients and acknowledged the importance of adherence with exercise; however, GPs placed responsibility for adherence on the patient. One GP felt the attitude statements were '*simplistic and not holistic enough*' and reflected '*limited understanding of knee pain in context of patients' life*'.

Only 3% (n=23) of GPs attitudes and beliefs about exercise were in line with evidence-based recommendations, a third (n=269, 32%) were broadly in line and the rest (n=543, 65%) were not in line. Among the 810 respondents who could be included in the analysis, one-way ANOVA demonstrated there was no significant difference in the mean (95% CI) biomedical subscale scores of GPs according to the extent to which GPs' attitudes and beliefs were in line with evidence-based exercise recommendations (see Table 6-11). Among the 813 respondents who could be included in the analysis, higher scores on the behavioural treatment orientation subscale appeared to differentiate the GPs whose attitudes and beliefs are more in line with evidence-based exercise recommendations (see Table 6-11).

Table 6-11 Mean adapted PABS_PT subscale score according to whether GPs' beliefs were in line with evidence-based exercise recommendations

Alignment of attitudes and beliefs with evidence-based exercise recommendations	Mean (95% CI) subscale score	
	Biomedical (n=810)	Behavioural (n=813)
In line	34.7 (32.7, 36.8)	36.5 (35.1, 37.9)
Broadly in line	33.4 (32.8, 34.0)	34.7 (34.3, 35.2)
Not in line	33.2 (32.7, 33.6)	33.9 (33.6, 34.2)
Result of one-way ANOVA	ANOVA F = 1.213, df 2,807; p=0.298	**ANOVA F = 10.061, df 2,810; p<0.001**

Table 6-12 Responses to MOVE attitude statements

Attitude statement	(Strongly) disagree	Neither disagree or agree	(Strongly) agree
Items relating to the benefits of exercise			
GPs should prescribe quadriceps strengthening exercises to every patient with CKP	8%	22%	69%
GPs should prescribe general exercise, for example, walking or swimming, for every patient with CKP	3%	8%	89%
Knee problems are improved by quadriceps strengthening exercises	<1%	11%	88%
Knee problems are improved by general exercise, for example, walking or swimming	1%	7%	93%
Quadriceps strengthening exercises for the knee are safe for everybody to do	15%	30%	56%
General exercise, for example, walking or swimming, is safe for everybody to do	13%	16%	71%
Exercise is effective for patients if an x-ray shows severe knee osteoarthritis	16%	32%	52%
Exercise works just as well for everybody, regardless of the amount of pain they have	49%	29%	22%
Increasing the strength of the muscles around the knee stops the knee problem getting worse	16%	29%	55%
Increasing the overall activity levels stops the knee problem getting worse	19%	38%	43%
Items relating to the delivery of, and adherence to, exercise			
Exercise for CKP is most beneficial when it is tailored to meet individual patient needs	1%	9%	90%
A standard set of exercises is sufficient for every patient with chronic knee problems	51%	36%	13%
GPs should educate CKP patients about how to change their lifestyle for the better	1%	6%	93%
It is important that people with CKP increase their overall activity levels	1%	10%	89%
How well a patient complies with their exercise programme determines how effective it will be	3%	11%	86%
GPs should follow-up patients to monitor extent of continuation of exercises	30%	37%	34%
It is the patient's own responsibility to continue doing their exercise programme	1%	6%	93%

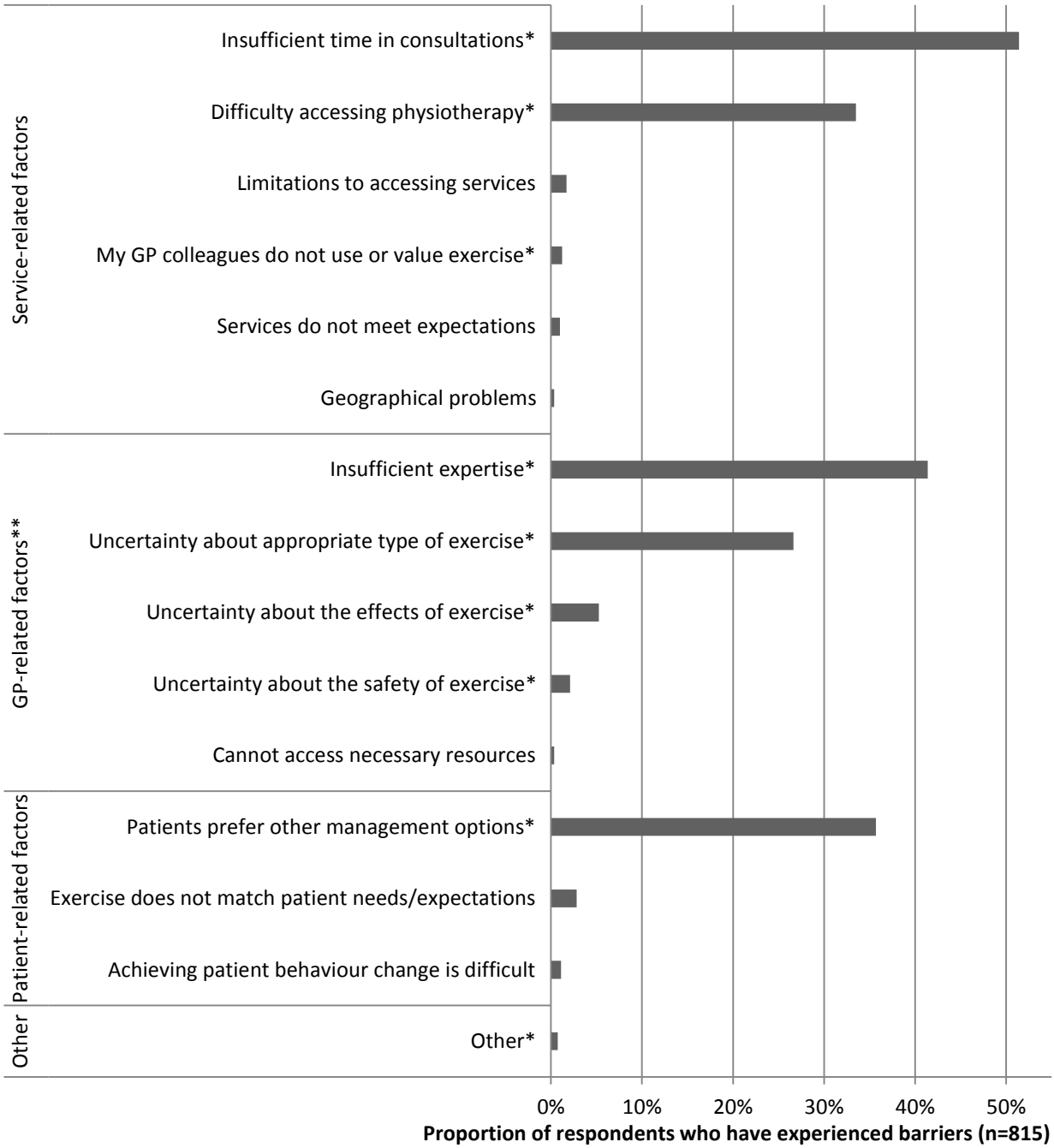
Consensus categorised according to: unamity = 100% (red), consensus = 75-99% (orange), majority view = 51-74% (yellow), no consensus = 0-50% (blue) (175,355). CKP = chronic knee pain. Maximum missing data for any item was 2%.

6.3.5 Barriers to the use of exercise

When asked using a closed question, the majority (n=815, 98%) of GPs reported that they had experienced barriers when using exercises for patients with CKP. Such barriers fell into three main groups (summarised in Figure 6-4): 1) service-related issues (insufficient time in consultations, difficulty accessing physiotherapy and other necessary services, GP colleagues not using or valuing exercise, services not meeting expectations), 2) GP-related factors (e.g. insufficient expertise, uncertainty about the most appropriate type of exercise, uncertainty about the effects and/or safety of exercise, inability to access the necessary resources, not prioritising exercise and poor understanding about what physiotherapy offers) and 3) (perceived) patient-related factors (e.g. perception that patients prefer other management options, the view that exercise does not match patient needs and/or expectations, and the challenges of achieving patient behaviour change). Insufficient time, insufficient expertise and the perception that patients prefer other management options were the most frequently reported barriers. Free-text comments which underwent thematic analysis (described in Section 6.2.5.3) provided extra detail regarding barriers faced by GPs when using exercise for patients with CKP. Themes regarding these barriers, the associated concepts and examples of responses for each of these are outlined in Table 6-13. Particularly rich were the free text responses relating to GPs' beliefs that exercise does not match patients' needs and/or expectations. Within this concept were multiple responses relating to patients wanting a '*quick fix*', patients being unable to exercise due to pain and that exercise makes the pain worse. GPs also reported negative responses from patients being '*sceptical*' about, not receptive to ('*eyes glaze over*') and even

annoyed by the suggestion of exercise. Further, a perception of futility among GP respondents in providing exercise advice for patients with CKP was indicated by multiple ticks being given next to the response '*patients prefer other management options*'.

Figure 6-4 Barriers to using exercise reported by GPs



*Barriers provided as a multiple response option in the questionnaire (informed by thematic analysis of pilot survey results), remaining responses were coded from free-text responses. **The items 'GP does not prioritise exercise' and 'unclear what physio offers' was not included in this figure as only 1/815 GPs provided these responses

Table 6-13 Summary of themes, concepts and examples of free text responses regarding barriers to the use of exercise for CKP

Theme	Concepts	Given as a response option	Example of coded response
Service-related	Insufficient time in consultations	✔	[Nil additional free text comments given]
	Difficulty accessing physiotherapy	✔	"Takes 18 weeks to see a physio"
	Limitations to accessing services	✘	"Pressure on reducing referrals" "Loss of local fitness initiative" "Lack of any facilities in our local area for people to group exercise - no sports or leisure facility." "Cost of exercise to patient e.g. Gym membership"
	My GP colleagues do not use or value exercise	✔	[Nil additional free text comments given]
	Services do not meet expectations	✘	"…some patients wait for 3/12 and once they've seen they've been given a leaflet to do exercise at home, this does not meet patients' expectations" "Only get 2 physio sessions if we refer them" "Physiotherapy appointments are not long enough"
	Geographical problems	✘	"Remote location of practice deters patients from travelling to a gym" "Patients are too scared to walk in local area"
GP-related	Insufficient expertise to give detailed information	✔	[Nil additional free text comments given]
	Uncertainty about the most appropriate type of exercise	✔	[Nil additional free text comments given]
	Uncertainty about the effects of exercise	✔	[Nil additional free text comments given]
	Uncertainty about the safety of exercise	✔	[Nil additional free text comments given]
	Cannot access necessary resources	✘	"Lack of structured approach I know the info is out there somewhere - don't have time or energy to search" "Detailed leaflet sounds good - if I have time I will look at arthritis UK website"
	GP does not prioritise exercise	✘	"Perhaps I should give it a higher priority"
	Unclear what physio offers	✘	"Little feedback from physiotherapy about advice offered/range of services"

Patient-related	Patients prefer other management options	✔	“When mention physiotherapy and exercise most patients don't want this - 'they just give you exercises and it makes the pain worse'”
	Exercise does not match patient needs/expectations	✘	“Patients want a 'quick fix' losing weight and increasing exercise is more difficult” “Patients so overweight that they cannot even consider exercise - in fact this annoys them” “Patient appearing so debilitated by chronic pain that exercise cannot be tolerated” “Patient refusal to engage with regular exercise due to perceived time constraints and fear of harming themselves” “I advise on quad strengthening, patients often sceptical this is enough to help relieve their symptoms” “Specialist colleagues appear to always want MRI/CT/xray/arthroscopy + people talk to each other (I had this + the specialist did….)”
	Achieving patient behaviour change is difficult	✘	“ Very difficult to get many patients to change lifestyle sufficiently to effect enough real change to help knee pain” “Many pts are lazy!” “patient reluctance” “Requires significant patient re-education and elements of motivational interviewing so potentially v time consuming”
Other	Other	✔	“physiotherapy (referral) needs to be prioritised”

6.3.6 Influences on the use of exercise for CKP

Results from the investigations undertaken to identify the influences on clinical behaviour are now presented and are mapped on to the underpinning theoretical model (described in Chapter 2). Descriptive analyses are first presented before detailing the outcomes of tests of associations between each component of the model and GPs' behaviour.

6.3.6.1 Influences on behaviour: beliefs about consequences

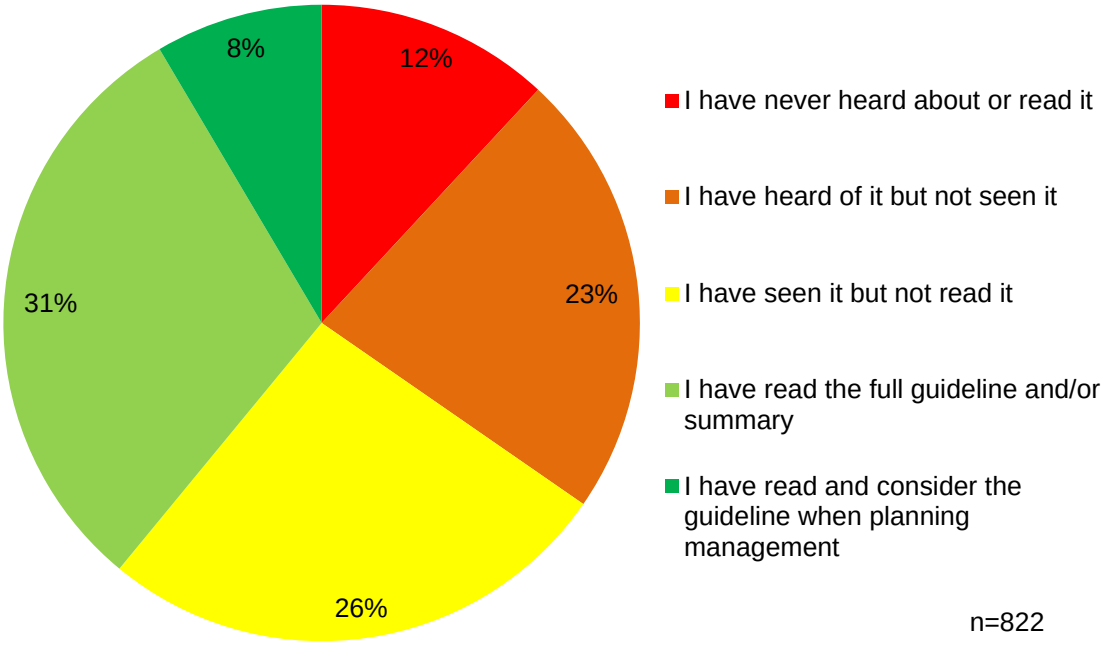
Results pertaining to beliefs about consequences have been divided into items relating to awareness of management recommendations, knowledge and attitudes about the efficacy of exercise, factors that may be perceived to influence the efficacy of exercise and GPs' understanding of the risks and safety of exercise. Each are now presented.

Awareness of management recommendations

Of the 822 GPs responding to the item, 61% of GPs reported that they had not read the NICE OA guidelines, see Figure 6-5. Only a minority (3%) of responding GPs agreed that exercise for CKP should preferably be used after drug treatment has been tried. The use of individual core, adjunct and not-recommended treatment strategies was examined; there was frequent use of some second-line (e.g. oral NSAIDS, 44%) and not-recommended approaches (e.g. glucosamine and chondroitin, 18%) (see Table 6-14). When the overall use of core, adjunct and not-recommended strategies were examined, 58% GPs reported using all three recommended core management strategies and only three did not use any of the core management strategies (see Table 6-15). Just over half (56%) GPs used at

least one second-line strategy at the first consultation with the vignette patient. Nearly a quarter of GPs (22%) used a not-recommended treatment strategy and one GP reported they would use all three of the not-recommended treatment strategies that were investigated. Among those using glucosamine, some GPs explicitly recognised this not to be evidence-based ('*explain not evidence-based*', '*mention weak evidence base*') and one indicated that they would use this as '*some interested in alterative* [treatment]'.

Figure 6-5 Reported awareness of 2008 NICE OA guidelines



There was consensus agreement that it is important for people with CKP to increase their overall activity levels (89%), that exercise for CKP is most beneficial when tailored to meet individual patient needs (90%) and that the extent to which a patient complies with their exercise programme determines how effective it will be (86%). There was majority disagreement (51%) that a standard set of exercises is sufficient for every patient with CKP. These responses were summarised in Table 6-12.

Table 6-14 Proportion of respondents using specific management options

Core management	Adjunct to core treatments		Not recommended by NICE**
	First line	Second line	
Weight loss (95%) Exercise (87%) Education to support self-management (67%)* Advice on footwear (23%) Written info (60%)*	Paracetamol (87%) Topical NSAIDs (47%) Local heat or cold • Ice (15%) • Heat (12%) Topical capsaicin (4%) Assistive devices – e.g. walking sticks (3%) TENS (1%) [Assessment for bracing/joint supports/insoles if instability - elasticated knee support (<1%)]	Oral NSAIDS (44%) Opioids • Weak (24%) • Strong (<1%) COX-2 inhibitors (1%)	Glucosamine or chondroitin (18%) Acupuncture (6%) Tricyclic agents ('Antidepressants' <1%) [Rubefacients (<1%)] [Intra-articular hyaluronan injections (0%)]
	Intra-articular corticosteroid injections (7%) Referral for joint surgery*** (orthopaedic referral 1%)		
Follow-up for all patients with symptomatic OA			

* n=825. ** Arthroscopy lavage and debridement not presented as not related to GP activity (would be included in orthopaedic referral). ***Referral destination only collected, not reason, this may include referral for joint surgery or arthroscopy. Items in square brackets were not provided as multiple response options, all other management options were provided. COX = cyclooxygenase; NSAID = non-steroidal anti-inflammatory drug; OA = osteoarthritis; TENS = transcutaneous electrical nerve stimulation

Table 6-15 Reported use of core, first-line, second-line and not-recommended management strategies

		Proportion of respondents reporting use of management strategy			
		Core strategies	First line strategies	Second line strategies	Not recommended strategies
Responses used to assess use of strategy		Weight loss, exercise and provision of written information or footwear advice	Ice, heat, TENS, walking stick, paracetamol, topical NSAID and/or topical capsaicin	Oral NSAID, COX-2 inhibitors and weak or strong opioids	Glucosamine/ chondroitin, antidepressants and acupuncture
Number of management approaches used	0	<1%	7%	**44%**	**78%**
	1	7%	**41%**	42%	20%
	2	34 %	36%	13%	2%
	3	**58%**	12%	<1%	<1%
	4	--	4%	0%	--
	5	--	1%	--	--
n=		825	833	835	834

Knowledge and attitudes about the efficacy of exercise

There was consensus agreement that knee problems are improved by local (88%) and general (93%) exercises. Of the 815 GPs who reported previously experiencing barriers to the use of exercise only 43 (5%) GPs reported uncertainty about the effects of exercise as being included in these barriers. Although there was majority agreement that increasing the strength of the muscles around the knee stops the knee getting worse (55%) there was no consensus that increasing overall activity stops the knee problem from getting worse (43% agreed). These responses were summarised in Table 6-12.

Factors that may be perceived to influence the efficacy of exercise

Most responding GPs believed the vignette patient's symptoms and underlying joint damage were moderate. Among the 812 GPs who responded with their beliefs about the severity of symptoms and underlying joint damage in the vignette patient, these beliefs were associated but not exactly aligned, see Table 6-16. Nearly half (49%) GPs disagreed that exercise works just as well for everybody, regardless of the amount of pain they have (see Table 6-12).

Table 6-16 Alignment of GPs' beliefs about the severity of symptoms and the underlying joint damage of the vignette patient

Severity of symptoms (n=812)	Severity of underlying knee damage				
	Very severe	Severe	Moderate	Mild	Very mild
Very Severe	<1%	0%	0%	<1%	0%
Severe	0%	6%	7%	<1%	<1%
Moderate	0%	2%	**56%**	18%	<1%
Mild	0%	0%	2%	8%	<1%
Very mild	0%	0%	0%	0%	0%

Among the 830 GPs who provided a description of the diagnosis they would give to the patient, 83% GPs used '*wear and tear*' or a term relating to this concept (e.g. '*wear*', '*wearing*', '*worn*'). Wear and tear was used in a variety of contexts; to indicate

the diagnosis was not inflammatory arthritis ('*Knees are most likely suffering from "wear and tear" type of arthritis is not the destructive type which causes wasting of hands*'), to explicitly link to the negative impact of exercise ('*pain bilaterally suggests wear and tear as worse on exercise'*) and to normalise the condition ('*Over the age of 40 everyone gets wear + tear arthritis*'). Some GPs used the term despite recognising it to be inaccurate ('*I know this is no longer advised explanation but I can't stop myself → wear and tear*'). A third of GPs used the terms relating to the concept of arthritis or OA, 5% of GPs described the diagnosis as a wear and repair process and an additional 2% of GPs stated they would use the wear and tear concept but qualified this with an explanation of why this is not appropriate and/or an accurate description of the problem. Some GPs recognised the potential for a negative impact of the explanation of the diagnosis they gave, two stated they would not use the '*dreaded*' or '*disastrous*' term '*osteoarthritis*' and one GP explicitly stated they would only include the patient being overweight in the description if they were '*brave enough*'.

Most GPs agreed that being overweight/obese (99%), accident or injury (95%) and aging (90%) are risk factors for CKP. Although most responding GPs (98%) agreed that OA is a risk factor for CKP, only 63% agreed that changes consistent with OA seen on x-ray were a risk factor; see Table 6-18. With regards to prognosis, 14% did not suggest a positive or negative future, 28% believed the future would be negative ('*continued gradual deterioration expected'*), 33% believed it would be positive ('*symptoms are likely to gradually improve over time*') and 25% believed it may be both positive and negative (e.g. will eventually get worse but there are some things that can be done to delay the inevitable deterioration; '*consider analgesia*

may benefit from surgery in future'). Two-thirds of responding GPs stated that they would request a knee x-ray at the initial consultation, usually to confirm the diagnosis; see Table 6-19. Only 52% of GPs agreed that exercise is effective for patients if knee x-ray shows severe knee OA and a quarter disagreed (see Table 6-12).

Table 6-17 Description of diagnosis given to the vignette patient

Theme	Concepts used in the response	Example of coded response*	Proportion n=830
Disease process	Wear and tear**	"knees worn down"	83%
	Arthritis or osteoarthritis	"osteophytes" "degeneration"	33%
	Inflammation	"inflammatory flare"	6%
	Wear and repair	"worn and replaced"	5%
	Acknowledged wear and tear not appropriate/accurate**	"…due to…wear and tear but it is more complicated than that"	2%
	Not inflammatory arthritis	"not the destructive type which causes wasting of hands"	2%
	Do not describe condition as arthritis	"I do not use the dreaded words 'arthritis'"	<1%
Aetiology	Relationship with being overweight/obese	"not helped by ^BMI"	17%
	Relationship with age	"from years of use"	13%
	Relationship with lifestyle factors	"aggravated by certain activities"	3%
	Mechanical cause	"problem with mechanics of knee"	3%
	Relationship with occupation	"aggravated by occ…"	2%
	Hereditary	"genetics"	1%
Structures involved	Cartilage	"loss of cushioning protection"	11%
	Joint surface	"bone grinding against bone"	8%
	Knee cap	"front compartment of knee"	5%
	Muscle	"can be improved with exercise to build muscles up"	2%
	Joint space	"narrowing of the knee joint"	1%
	Tendon	"…irritation of the tendon…"	1%
Candidacy	Problem is treatable	"easily treated"	5%
	Problem normalised	"sadly this happens to us all"	5%
	Stage of the diagnosis	"…pre-osteoarthritis"	5%
	Extent of underlying damage is minimal	"your knee isn't too bad"	4%
	Condition is inevitably progressive	"degerative and progressive condition which is usually managed rather than cured – terribly sorry"	2%
	Condition is not inevitably progressive	"doesn't necessarily get progressively worse"	2%
	Extent of underlying damage is significant	"Some badly damage to joints"	1%
	Diagnosis has functional impact	"not dangerous but interferes with your daily activities"	1%
Uncertain	Uncertainty over diagnosis given	"subject to confirmation"	18%
	Investigation results needed before diagnosis given	"does need further tests to confirm"	2%
Other	Other diagnosis given	"supporting soft tissue no longer strong enough to support the joint"	<1%

*Excluding those that are identical to the code for the concept **Mutually exclusive

Table 6-18 Agreement with potential causes of CKP

Risk factors	Possible cause of CKP presented in questionnaire survey (responses)	(Strongly) Disagree	Neither agree or disagree	(Strongly) Agree
Non-modifiable				
Age	Aging	2%	7%	90%
Heritability	Hereditary/runs in the family	23%	30%	47%
Radiographic changes	Changes consistent with osteoarthritis seen on x-ray	9%	28%	63%
Modifiable				
Overweight and obesity	Being overweight/obese	<1%	<1%	99%
Injury	Accident or injury	1%	4%	98%
Occupation	Manual work	8%	20%	73%
Physical activity/sport	Sport	8%	15%	77%
Depression or poor mental health	A person's own mental attitude e.g. thinking about life negatively	10%	20%	71%
	A person's emotional state e.g. feeling down, anxious	9%	16%	75%

Maximum missing data for any item was 2%.

Table 6-19 Reported use, and reasons for use, of investigations for the vignette patient at the first consultation

Investigation	Number GPs using this investigation (% all respondents)	Reason(s) given for use of investigation (% those using the investigation)					
		Reassure patient	Meet referral criteria	To confirm the diagnosis	Inform treatment	Rule out other diagnoses	Inform prognosis
Knee x-ray	564 (68%)	22%	7%	78%	27%	22%	20%
None	223 (27%)	---	---	---	---	--	---
Oxford knee score*	182 (22%)	8%	56%	6%	37%	1%	18%
Blood test	157 (19%)	17%	1%	10%	8%	87%	6%
Other**	21 (3%)	10%	10%	57%	29%	24%	24%

*Although it was noted that the Oxford Knee Score is not an investigation, it was a response that was offered by two respondents to the pilot survey so it was added as a response option in the main survey. ** Of which the most common was magnetic resonance imaging (MRI) n=4

Understanding the risks and safety of exercise

Results relating to the adapted PABS_PT, which establishes GPs attitudes about CKP and, related to this, attitudes about the safety of exercise, have already been described in Section 6.3.4.1. One in six (15% and 13%, respectively) GPs disagreed that quadriceps strengthening and general exercises are safe for everybody to do. However, of the 815 GPs who reported previously experiencing barriers to the use of exercise only 17 (2%) highlighted uncertainty about the safety of exercise as being included in these barriers. Uncertainty may be inferred by neither disagree nor agree responses to the MOVE consensus-derived attitude statements relating to the safety and efficacy of exercise. Among the minority of GPs who did not agree with these attitude statements, more GPs indicated uncertainty than disagreement, see Table 6-12. The differential was particularly marked for statements relating to local exercises compared with general exercises.

Testing the association between beliefs about consequences and use of exercise

Testing associations with exercise use: awareness of management recommendations

A small but statistically significant difference was noted in the use of exercise among GPs who reported having read the guidelines (91%) compared to those who had not (85%; OR 1.68 (1.07, 2.64). When compared to exercise use among GPs neither disagreeing nor agreeing with the statement '*exercise should only be used after drug treatment has been tried'* (79%), GPs disagreeing with the statement used exercise more frequently (89%, OR 2.10 (1.22, 3.63)); exercise use among those agreeing with the statement (86%) was not significantly different (OR 1.62 (0.50, 5.22)). Using a second-line or not-recommended treatment strategy did not significantly reduce the concurrent use of exercise; OR 0.77 (0.51, 1.17) and OR 1.44 (0.85, 2.47)

respectively. Associations between agreement with relevant MOVE consensus attitude statements and the use of exercise are summarised in Table 6-20 and Table 6-21. Exercise use was significantly increased among those agreeing that it is important that people with CKP increase their overall activity levels (OR 2.18 (1.22, 3.91)), when compared with GPs who neither disagreed nor agreed. No significant associations were identified with the use of exercise among those disagreeing with these items compared with GPs who neither disagreed nor agreed. Disagreeing with the statement '*How well a patient complies with their exercise programme determines how effective it will be*' was significantly associated with reduced use of exercise (OR 0.33 (0.11, 0.96), compared with GPs who neither disagreed nor agreed, however the number of GPs disagreeing was small and thus the CI is wide.

Table 6-20 Use of exercise according to responses to MOVE attitude statements: benefits of exercise

Attitude statement	Response to attitude statement	Using exercise		OR (95% CI) for use of exercise*
		No	Yes	
GPs should prescribe quadriceps strengthening exercises to every patient with CKP	Neither disagree or agree	42 (23%)	142 (77%)	1.00
	(Strongly) disagree	12 (18%)	56 (82%)	1.38 (0.68, 2.81)
	(Strongly) agree	50 (9%)	520 (91%)	**3.08 (1.96, 4.83)**
GPs should prescribe general exercise, for example, walking or swimming, for every patient with CKP	Neither disagree or agree	17 (25%)	50 (75%)	1.00
	(Strongly) disagree	3 (13%)	21 (88%)	2.38 (0.63, 8.99)
	(Strongly) agree	84 (11%)	649 (89%)	**2.63 (1.45, 4.76)**
Knee problems are improved by quadriceps strengthening exercises	Neither disagree or agree	26 (28%)	67 (72%)	1.00
	(Strongly) disagree	0 (0%)	3 (100%)	----
	(Strongly) agree	78 (11%)	650 (89%)	**3.23 (1.94, 5.39)**
Knee problems are improved by general exercise, for example, walking or swimming	Neither disagree or agree	14 (26%)	40 (74%)	1.00
	(Strongly) disagree	0 (0%)	4 (100%)	----
	(Strongly) agree	90 (12%)	676 (88%)	**2.63 (1.38, 5.02)**
Quadriceps strengthening exercises for the knee are safe for everybody to do	Neither disagree or agree	44 (18%)	200 (82%)	1.00
	(Strongly) disagree	15 (13%)	105 (88%)	1.54 (0.82, 2.90)
	(Strongly) agree	45 (10%)	412 (90%)	**2.01 (1.29, 3.15)**
General exercise, for example, walking or swimming, is safe for everybody to do	Neither disagree or agree	26 (20%)	106 (80%)	1.00
	(Strongly) disagree	14 (13%)	91 (87%)	1.59 (0.79, 3.24)
	(Strongly) agree	64 (11%)	519 (89%)	**1.99 (1.21, 3.28)**
Exercise is effective for patients if an x-ray shows severe knee osteoarthritis	Neither disagree or agree	42 (16%)	219 (84%)	1.00
	(Strongly) disagree	24 (18%)	108 (82%)	0.86 (0.50, 1.50)
	(Strongly) agree	38 (9%)	391 (91%)	**1.97 (1.24, 3.15)**
Exercise works just as well for everybody, regardless of the amount of pain they have	Neither disagree or agree	32 (13%)	207 (87%)	1.00
	(Strongly) disagree	55 (14%)	349 (86%)	0.98 (0.61, 1.57)
	(Strongly) agree	17 (9%)	163 (91%)	1.48 (0.80, 2.76)
Increasing the strength of the muscles around the knee stops the knee problem getting worse	Neither disagree or agree	37 (15%)	203 (85%)	1.00
	(Strongly) disagree	19 (15%)	109 (85%)	1.05 (0.57, 1.91)
	(Strongly) agree	48 (11%)	408 (90%)	1.55 (0.98, 2.46)
Increasing the overall activity levels stops the knee problem getting worse	Neither disagree or agree	39 (13%)	270 (87%)	1.00
	(Strongly) disagree	28 (18%)	130 (82%)	0.67 (0.40, 1.14)
	(Strongly) agree	37 (10%)	318 (90%)	1.24 (0.77, 2.00)

*Emboldened figures are statistically significant. CI = confidence interval; GP = general practitioner; OR = odds ratio

Table 6-21 Use of exercise according to responses to MOVE attitude statements: delivery of, and adherence to, exercise

Attitude statement	Response to attitude statement	Using exercise		OR (95% CI) for use of exercise
		No	Yes	
Exercise for CKP is most beneficial when it is tailored to meet individual patient needs	Neither disagree or agree	13 (18%)	60 (82%)	1.00
	(Strongly) disagree	0 (0%)	9 (100%)	----
	(Strongly) agree	91 (12%)	650 (88%)	1.55 (0.82, 2.93)
A standard set of exercises is sufficient for every patient with chronic knee problems	Neither disagree or agree	38 (13%)	254 (87%)	1.00
	(Strongly) disagree	54 (13%)	367 (87%)	1.02 (0.65, 1.59)
	(Strongly) agree	9 (8%)	99 (92%)	1.65 (0.77, 3.53)
GPs should educate CKP patients about how to change their lifestyle for the better	Neither disagree or agree	12 (24%)	38 (76%)	1.00
	(Strongly) disagree	3 (33%)	6 (67%)	0.63 (0.14, 2.92)
	(Strongly) agree	88 (12%)	676 (89%)	**2.43 (1.22, 4.82)**
It is important that people with CKP increase their overall activity levels	Neither disagree or agree	17 (22%)	62 (79%)	1.00
	(Strongly) disagree	5 (50%)	5 (50%)	0.27 (0.07, 1.06)
	(Strongly) agree	82 (11%)	653 (89%)	**2.18 (1.22, 3.91)**
How well a patient complies with their exercise programme determines how effective it will be	Neither disagree or agree	12 (13%)	79 (87%)	1.00
	(Strongly) disagree	7 (32%)	15 (68%)	**0.33 (0.11, 0.96)**
	(Strongly) agree	85 (12%)	627 (88%)	1.12 (0.59, 2.14)
GPs should follow-up patients to monitor extent of continuation of exercises	Neither disagree or agree	37 (12%)	265 (88%)	1.00
	(Strongly) disagree	33 (13%)	212 (87%)	0.90 (0.54, 1.48)
	(Strongly) agree	33 (12%)	243 (88%)	1.03 (0.62, 1.70)
It is the patient's own responsibility to continue doing their exercise programme	Neither disagree or agree	6 (13%)	42 (88%)	1.00
	(Strongly) disagree	2 (29%)	5 (71%)	0.36 (0.06, 2.27)
	(Strongly) agree	96 (12%)	675 (88%)	1.00 (0.42, 2.43)

*Emboldened figures are statistically significant. CI = confidence interval; GP = general practitioner; OR = odds ratio

Testing associations with exercise use: factors that may be perceived to influence the use of exercise

A trend towards increased use of exercise if the GP thought the symptoms were (very) mild, compared to (very) severe was suggested but was not statistically significant (see Table 6-22). Compared to GPs who thought the underlying knee damage was (very) severe, there was a trend towards increased exercise use among those who thought it was moderate (significant) and (very) mild (non-significant, see Table 6-22).

Table 6-22 Unadjusted logistic regression examining the use of exercise according to beliefs about severity of symptoms and underlying knee damage

	Belief about severity	Using exercise		Odds ratio (95% CI)*
		No	Yes	
Symptoms	Very severe/severe	14 (13%)	92 (87%)	1.00
	Moderate	84 (13%)	552 (87%)	1.00 (0.55, 1.84)
	Very mild/mild	5 (6%)	77 (94%)	2.34 (0.81, 6.80)
Underlying knee damage	Very severe/severe	14 (22%)	50 (78%)	1.00
	Moderate	59 (11%)	471 (89%)	**2.24 (1.17, 4.29)**
	Very mild/mild	28 (13%)	194 (87%)	1.94 (0.95, 3.96)

*Emboldened figures are statistically significant

Use of exercise among those using the term '*wear and tear*' to describe the diagnosis was the same as that among GPs not using the term (OR 0.98 (0.56, 1.71)). There were trends towards increased use of exercise among those who thought CKP had modifiable risk factors and reduced use of exercise among those who believed CKP is due to non-modifiable factors but these were not statistically significant see Table 6-23. GPs' perceptions of the future were not significantly associated with the use of exercise, see Table 6-24.

Table 6-23 Unadjusted logistic regression examining the association between the use of exercise and causes of CKP

Risk factor	Agreement with item being risk factor	Using exercise		OR (95% CI)
		No	Yes	
Non-modifiable				
Hereditary/runs in the family	Neither agrees or disagrees	30 (12%)	212 (87%)	1.00
	(Strongly) disagrees	25 (13%)	163 (87%)	0.92 (0.52, 1.63)
	(Strongly) agrees	47 (12%)	338 (88%)	1.02 (0.62, 1.66)
Ageing	Neither agrees or disagrees	8 (13%)	53 (87%)	1.00
	(Strongly) disagrees	1 (5%)	18 (95%)	2.72 (0.32, 23.24)
	(Strongly) agrees	95 (13%)	653 (87%)	1.04 (0.48, 2.25)
Changes consistent with OA seen on x-ray	Neither agrees or disagrees	22 (10%)	207 (90%)	1.00
	(Strongly) disagrees	9 (12%)	67 (88%)	0.79 (0.35, 1.80)
	(Strongly) agrees	73 (14%)	447 (86%)	0.65 (0.39, 1.08)
Modifiable				
Accident or injury	Neither agrees or disagrees	7 (22%)	25 (78%)	1.00
	(Strongly) disagrees	2 (22%)	7 (78%)	0.98 (0.17, 5.82)
	(Strongly) agrees	94 (12%)	693 (88%)	2.06 (0.87, 4.90)
A person's own mental attitude	Neither agrees or disagrees	23 (14%)	140 (86%)	1.00
	(Strongly) disagrees	17 (22%)	61 (78%)	0.59 (0.29, 1.18)
	(Strongly) agrees	64 (11%)	518 (89%)	1.33 (0.80, 2.22)
A person's emotional state	Neither agrees or disagrees	19 (14%)	115 (86%)	1.00
	(Strongly) disagrees	12 (17%)	59 (83%)	0.81 (0.37, 1.79)
	(Strongly) agrees	73 (12%)	549 (88%)	1.24 (0.72, 2.14)
Sport	Neither agrees or disagrees	18 (14%)	108 (86%)	1.00
	(Strongly) disagrees	7 (10%)	60 (90%)	1.43 (0.57, 3.62)
	(Strongly) agrees	79 (13%)	553 (88%)	1.17 (0.67, 2.03)
Being overweight/obese	Neither agrees or disagrees	0 (0%)	3 (100%)	---
	(Strongly) disagrees	0 (0%)	3 (100%)	---
	(Strongly) agrees	103 (13%)	719 (88%)	---
Manual work	Neither agrees or disagrees	18 (11%)	144 (89%)	1.00
	(Strongly) disagrees	9 (15%)	53 (86%)	0.74 (0.31, 1.74)
	(Strongly) agrees	77 (13%)	527 (87%)	0.86 (0.50, 1.48)

CI = confidence interval; OR = odds ratio

Table 6-24 Unadjusted logistic regression examining the association between the use of exercise and beliefs about the future of the vignette patient

Beliefs about the future of the vignette patient	Using exercise		Odds ratio (95% CI)
	No	Yes	
Not positive or negative	15 (13%)	98 (87%)	1.00
Future negative	31 (14%)	195 (86%)	0.96 (0.50, 1.87)
Future positive	31 (12%)	239 (89%)	1.18 (0.61, 2.28)
Future positive and negative	22 (11%)	182 (89%)	1.27 (0.63, 2.55)

The use of exercise between those who reported that they would request a knee x-ray for the vignette patient (86%) was not significantly different compared to those who would not (89%; OR 0.76 (0.48, 1.19)). Those agreeing that exercise is effective for patients if an x-ray shows severe knee OA used exercise significantly more frequently (91%) compared to those neither disagreeing nor agreeing with this statement (84%, OR 1.97 (1.24, 3.15)). Use of exercise among GPs who disagreed with this statement did not differ significantly from the proportion who neither disagreed nor agreed. There was no significant difference in the use of exercise among GPs agreeing or disagreeing that exercise works just as well for everybody regardless of the amount of pain they have when compared to those neither disagreeing or agreeing.

Testing associations with exercise use: understanding of the risks and safety of exercise

Exercise use was significantly greater among GPs agreeing that quadriceps strengthening exercises and general exercises are safe for everybody to do (90% and 89%, respectively) compared with those GPs neither disagreeing nor agreeing with these statements (82% (OR 2.01 (1.29, 3.15)) and 80% (OR 1.99 (1.21, 3.28)), respectively). No significant difference in exercise use was observed between those who had experienced uncertainty about the safety of exercise as a barrier (82%)

when compared to those who had not (87%; OR 0.67 (0.19, 2.38)), although numbers were small.

Use of exercise according to treatment orientation, determined by the adapted PABS_PT, only demonstrated a statistically significant association in the use of exercise among those in the top 25% on the behavioural subscale, compared with those in the bottom 25% (OR 1.87 (1.03, 3.39)). No corresponding significant association was found in the biomedical subscale, although a trend in the expected direction was observed, see Table 6-25.

Table 6-25 Association between the use of exercise and treatment orientation

Subscale	Score quartile	Using exercise		Odds ratio (95% CI)
		No	Yes	
Biomedical	Bottom 25%	20 (11%)	171 (90%)	1.00
	Top 25%	32 (17%)	162 (84%)	0.59 (0.33, 1.08)
Behavioural	Bottom 25%	33 (18%)	153 (82%)	1.00
	Top 25%	20 (10%)	173 (90%)	**1.87 (1.03, 3.39)**

Summary of the impact of beliefs about consequences on the use of exercise

Table 6-25 summarises the results that pertain to the beliefs about consequences element of the underpinning theoretical model. While some results, particularly those relating to awareness of recommendations and knowledge of the risks, safety and efficacy of exercise were related to exercise use, the responses about factors that may be perceived to influence efficacy of exercise were commonly not associated.

Table 6-26 Association of elements of the underpinning model with the use of exercise: beliefs about consequences

Item(s) in study questionnaire relating to this beliefs about consequences	Significantly associated with exercise use Odds ratio (95% CI) if significant	Comment
Awareness of management recommendations		
GP has read the NICE OA guideline	1.68 (1.07, 2.64)	
Agreement that exercise for CKP should preferably be used after drug treatment has been tried	✘	Disagreement associated with increased use of exercise (OR 2.10 (1.22-3.63) *
Concurrent use of first- and second-line and not-recommended treatment approaches	2.31 (1.19, 4.46) First-line	Concurrent use of second-line or not recommended approaches not associated
Agreement that exercise for CKP is most beneficial when it is tailored to meet individual patient needs	✘	Insufficient data to assess association with disagreement
Agreement that a standard set of exercises is sufficient for every patient with CKP	✘	Disagreement is not significantly associated*
Agreement that it is important that people with CKP increase their overall activity levels	2.18 (1.22, 3.91)*	Disagreement is not significantly associated*
Agreement that how well a patient complies with their exercise programme determines how effective it will be	✘	Disagreement associated with reduced use of exercise (OR 0.33 (0.11-0.96))*
Knowledge and attitudes about the efficacy of exercise		
Agreement that knee problems are improved by quadriceps strengthening exercises	3.23 (1.94, 5.39)*	Insufficient data to assess association with disagreement
Agreement that knee problems are improved by general exercise	2.63 (1.38, 5.02)*	Insufficient data to assess association with disagreement
Agreement that increasing the strength of the muscles around the knee stops the knee problems getting worse	✘	Disagreement is not significantly associated*
Agreement that increasing overall activity levels stops the knee problem getting worse	✘	Disagreement is not significantly associated*
Prior experience of being uncertain about the effects of exercise as a barrier to using exercise	0.13 (0.07, 0.24)	

Factors that may be perceived to influence efficacy of exercise		
GPs' beliefs about the severity of the patient's symptoms	✘	Trend towards increasing use of exercise if believe symptoms to be (very) mild**
GPs' beliefs about the severity of the underlying knee damage	Belief damage is moderate 2.24 (1.17, 4.29)**	Trend towards increasing use of exercise if believe symptoms to be (very) mild**
Use of the term wear and tear in the description of the diagnosis to the patient	✘	The term 'wear and tear' may not be a proxy for the belief that exercise will damage the joint further
Risk factors for CKP	✘	Trend towards increased exercise use if believe that risk factors modifiable and decreased exercise use if believe risk factors to be unmodifiable
Beliefs about the future for patients with CKP	✘	
Used knee x-ray for the vignette patient	✘	
Agreement that exercise is effective if the knee x-ray shows severe knee OA	1.97 (1.24, 3.15)*	Disagreement is not significantly associated*
Agreement that exercise works just as well for everybody, regardless of the amount of pain they have	✘	Disagreement is not significantly associated*
Knowledge about the risks/safety of exercises		
Agreement that quadriceps strengthening exercises for the knee are safe for everybody to do	2.01 (1.29, 3.15)*	Disagreement is not significantly associated*
Agreement that general exercise, for example walking or swimming is safe for everybody to do	1.99 (1.21, 3.28)*	Disagreement is not significantly associated*
Prior experience of being uncertain about the safety of exercise as a barrier to using exercise	✘	Small numbers, trend towards reduced exercise use if this barrier experienced
Biomedical treatment orientation subscale score in top 25%	✘	Trend towards lower use of exercise among those with top 25% scores^
Behavioural treatment orientation subscale score in top 25%	1.87 (1.03, 3.39)^	Indication that scores on this subscale may differentiate GPs whose attitudes are more in line with evidence-based exercise recommendations (see Section 6.3.4.2)

*Compared with use of exercise among those responding with neither disagree or agree; **Compared with severe/very severe; ^Compared with those with scores in bottom 25%. CKP = chronic knee pain; GP = general practitioner; OA = osteoarthritis.

6.3.6.2 Influences on behaviour: beliefs about social influences

Only 1% (10/807) of GPs reported that their GP colleagues' lack of use or not valuing exercise was a barrier they had experienced in using exercise for CKP. No significant association was found between the use of exercise among those who had experienced GP colleagues not valuing exercise as a barrier (100%) when compared with those who have not (87%, OR could not be calculated, Fisher's Exact Test p=0.624, due to small numbers, see Table 6-27).

6.3.6.3 Influences on behaviour: beliefs about moral norm

GPs' moral norms were investigated by statements suggesting that GPs should prescribe local and general exercise to all patients with CKP. Although 89% of GPs agreed that general exercise should be prescribed, only 69% agreed that local exercises should be prescribed to all patients with CKP. As summarised in Table 6-27 exercise use among those agreeing that local (91%; OR 3.08 (1.96, 4.83)) and general exercises (89%; OR 2.63 (1.45, 4.76)) should be prescribed to all patients was significantly greater than exercise use among those who neither disagreed nor agreed (local 77%, general 75%). Exercise use among those disagreeing with these statements did not significantly differ to those neither disagreeing nor agreeing, see Table 6-27.

Table 6-27 Association of elements of the underpinning model with the use of exercise: beliefs about social influences and moral norm

Item(s) in study questionnaire relating to beliefs about social influences and moral norm	Significantly associated with exercise use Odds ratio (95% CI) if significant	Comment
Social influences		
Experience of GP colleagues not using or valuing exercise as a barrier to using exercise	✘	Small numbers
Moral norm		
GPs should prescribe quadriceps strengthening exercises to every patient with CKP	3.08 (1.96, 4.83)*	Disagreement not significantly associated*
GPs should prescribe general exercise, for example, walking or swimming, for every patient with CKP	2.63 (1.45, 4.76)*	Disagreement not significantly associated*
*Compared with use of exercise among those responding with neither disagree nor agree		

6.3.6.4 Influences on behaviour: beliefs about role and identity

Most GPs agreed that managing patients with CKP is their role (98%) and that GPs should educate CKP patients about how to change their lifestyle for the better (93%). Only 278 (34%) of GPs believed it was their role to provide patients with CKP with a written management plan and 190 (23%) disagreed that this was their role. Free-text comments offered by some respondents indicated that inadequate time (in general or due to patients presenting with multiple problems) caused GPs to focus the available time in consultations to '*more life-threatening conditions*'. Most GPs (43%) indicated their role was to '*recommend the types of exercise patients could use*' (see Figure 6-7) and most (92%) agreed it is part of their job to reassure patients about the safety of exercise for CKP. Most GPs agreed (93%) that it is the patient's own responsibility to continue doing their exercise programme and only 34% agreed that GPs should follow-up patients to monitor the extent of continuation with exercises, see Table 6-12.

Figure 6-6 Attitudes about managing CKP in general

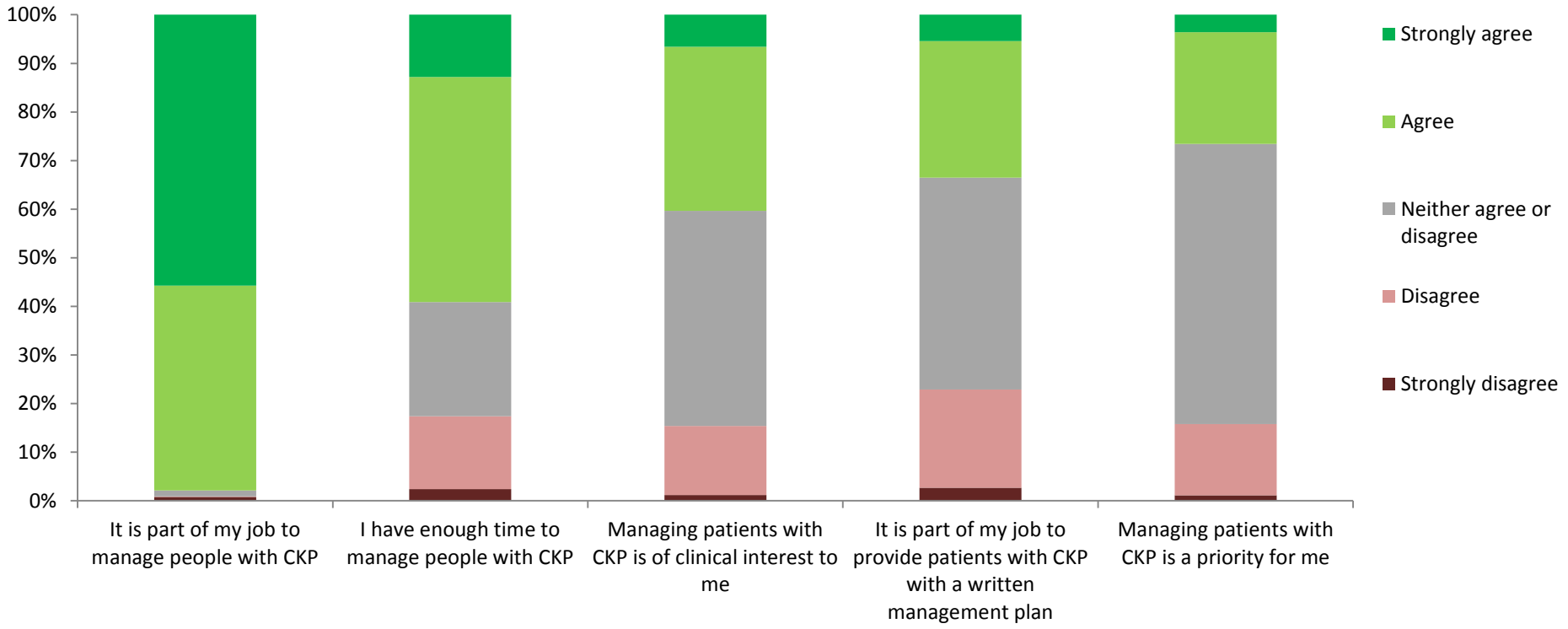
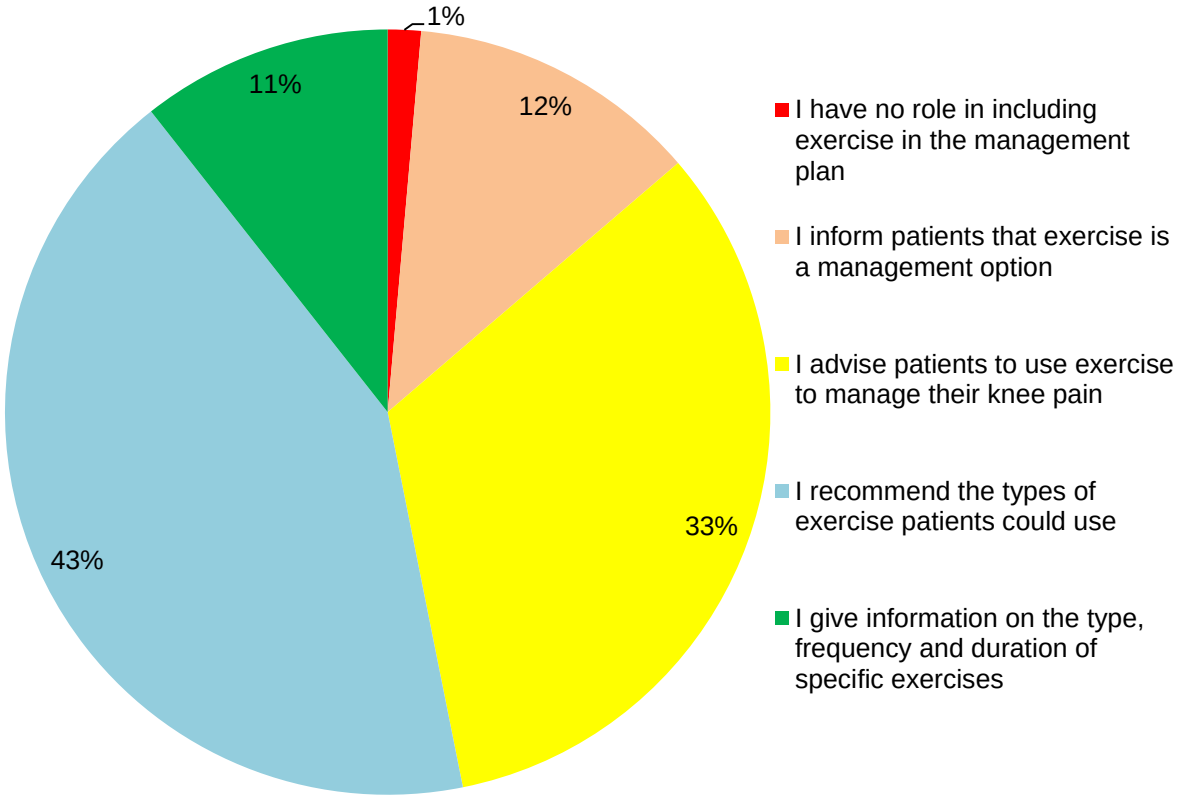


Figure 6-7 GPs' perceived role in including exercise in the management of a patient with CKP



Testing the association between GPs' perceived roles in initiating exercise for CKP and use of exercise

GPs' beliefs about whether it is their job to manage CKP in general was not associated with their use of exercise. Exercise use among GPs agreeing that they should educate patients with CKP about how to change their lifestyle for the better (89%) and that it is part of their job to provide patients with CKP with a written management plan (93%) was significantly higher than among those neither disagreeing nor agreeing with these statements, 76% (OR 2.43 (1.22, 4.82)) and 85% (OR 2.21 (1.29, 3.80)), respectively. Disagreement with these statements did not significantly impact the use of exercise.

GPs' beliefs about their role in initiating exercise in the management of a patient with CKP were significantly associated with their use of exercise; see Table 6-28. GPs who agreed that it is part of their job to reassure patients about the safety of exercise for CKP (89%) used exercise significantly more than those who neither disagreed nor agreed with this statement (70%, OR 3.57 (1.91, 6.59)). Disagreeing with this statement did not impact exercise use. Beliefs about it being the patients' own responsibility to continue doing their exercise programme or about GPs follow-up patients to monitor the extent of their continuation of exercises were not associated with the use of exercise, see Table 6-21.

Table 6-28 Use of exercise according to GPs' beliefs about their role in including exercise

Role	Use of exercise		OR (95% CI)*
	No	Yes	
I have no role in including exercise in the management plan	5 (42%)	7 (58%)	1.00
I inform patients that exercise is a management option	35 (34%)	67 (66%)	1.37 (0.40, 4.62)
I advise patients to use exercise to manage their knee pain	37 (14%)	238 (87%)	**4.60 (1.39, 15.24)**
I recommend the types of exercise patients could use	24 (7%)	329 (93%)	**9.79 (2.89, 33.17)**
I give information on the type, frequency and duration of specific exercises	2 (2%)	86 (98%)	**30.71 (5.02, 188.01)**

*Emboldened figures are statistically significant. CI = confidence interval; OR = odds ratio

Summary of the impact of beliefs about role and identity on the use of exercise

Table 6-29 summarises the significant associations between beliefs about role and identity and the use of exercise. There was a clear indication that GPs who believed they had a role in implementing exercise into the management plan of a patient with CKP is more likely to do so; indeed, the greater the perceived role the greater the odds that they would use exercise.

Table 6-29 Association of elements of the underpinning model with the use of exercise: beliefs about role and identity

Item(s) in study questionnaire relating to role and identity	Significantly associated with exercise use Odds ratio (95% CI) if significant	Comment
Agreement that it is part of their job to manage people with CKP	✘	Disagreement is not significantly associated*
Agreement that GPs should educate CKP patients about how to change their lifestyle for the better	2.43 (1.22, 4.82)*	Disagreement is not significantly associated*
Agreement that it is part of their job to provide patients with CKP with a written management plan	2.21 (1.29, 3.80)*	Disagreement is not significantly associated*
Beliefs about the role of a GP in including exercise in the management plan of a patient with CKP	30.71 (5.02, 188.01)** Give information on type, duration and frequency of exercise	The greater the believed role, the greater the OR for the use of exercise
Agreement that it is part of their role to reassure patients about the safety of exercise for CKP	3.57 (1.91, 6.59)*	Disagreement is not significantly associated*
Agreement that it is the patient's own responsibility to continue doing their exercise programme	✘	Disagreement is not significantly associated*
Agreement that GPs should follow-up patients to monitor extent of continuation of exercises	✘	Disagreement not significantly associated*

*Compared with use of exercise among those responding with neither disagree or agree; **Compared with belief that have no role in including exercise in the management plan. CI = confidence interval; CKP = chronic knee pain; GP = general practitioner; OR = odds ratio

6.3.6.5 Influences on behaviour: characteristics of GPs

Tests of association of exercise use and the demographic features of responding GPs suggested that reporting to be a GPwSI in musculoskeletal conditions and gender were associated with exercise use. While all GPwSI used exercise, the difference the use of exercise between males and females was statistically significant (yet small); 90% of female responders used exercise compared with 85% of male responders (OR 0.64 (0.42, 0.97); see Table 6-30).

Table 6-30 Association between the use of exercise and demographic variables

Variable	Characteristic	Using exercise		OR (95% CI)
		No	Yes	
Gender	Female	42 (10%)	375 (90%)	1.00
	Male	60 (15%)	341 (85%)	**0.64 (0.42, 0.97)**
Time since qualification	0-10 years	31 (13%)	212 (87%)	1.00
	11-20 years	23 (10%)	198 (90%)	1.26 (0.71, 2.23)
	21-30 years	34 (14%)	206 (86%)	0.89 (0.53, 1.50)
	≥31 years	15 (12%)	110 (88%)	1.07 (0.56, 2.07)
Type of GP	GP partner	80 (12%)	576 (88%)	1.00
	Salaried GP	22 (15%)	129 (85%)	0.81 (0.49, 1.36)
	Locum GP	2 (10%)	18 (90%)	1.25 (0.29, 5.49)
	Other	1 (20%)	4 (80%)	0.56 (0.06, 5.03)
Number of GPs in practice	1-5	39 (11%)	319 (89%)	1.00
	6-10	61 (15%)	344 (85%)	0.69 (0.45, 1.06)
	≥11	4 (6%)	60 (94%)	1.83 (0.63, 5.32)
Practice type	Urban	57 (13%)	392 (87%)	1.00
	Semi-rural	36 (13%)	239 (87%)	0.97 (0.62, 1.51)
	Rural	10 (10%)	93 (90%)	1.35 (0.67, 2.75)
GPwSI in MSK conditions	No	105 (13%)	676 (87%)	---- *
	Yes	0 (0%)	50 (100%)	
Postgraduate MSK training	No	66 (13%)	444 (87%)	1.00
	Yes	38 (12%)	281 (88%)	1.10 (0.72, 1.68)
Personal experience of CKP	No	88 (13%)	578 (87%)	1.00
	Yes	16 (10%)	150 (90%)	1.43 (0.81, 2.50)

Pearson Chi-squared = 7.694, df 1, **p=0.006**. CI = confidence interval; CKP = chronic knee pain; GP = general practitioner; GPwSI = general practitioner with special interest; MSK = musculoskeletal; OR = odds ratio

6.3.6.6 Influences on behaviour: beliefs about capabilities

Results regarding beliefs about capabilities have been divided into those relating to service-, GP- and patient-factors. These results, and their association with the GPs' use of exercise, are presented below.

Service-related factors

Time was regularly reported as an issue for GPs when managing CKP. Only 59% of all responding GPs agreed that they have enough time to manage patients with CKP and 82% agreed that time constraints prevent GPs from providing advice on individual exercises for CKP. Of the 815 GPs who reported having previously experienced barriers to using exercise, 51% highlighted insufficient time available in consultations as a barrier (see Figure 6-4). Among GPs who reported that they

would use exercise for the vignette patient, time was highlighted as a barrier to using specific types of exercise when they would otherwise like to (general 48% (13/27), local 34% (26/76)). Problems with accessing services were also highlighted; 83% of all responders agreed that exercise for CKP would be used more frequently if access to physiotherapy was easier and, of the 815 GPs reporting previous experience of barriers to the use of exercise, 34% reported difficulty accessing physiotherapy as one of these barriers. Difficulties with accessing physiotherapy were often attributed to perceptions of long waiting lists, but physical distance was also highlighted as an issue by one GP '*26 miles to nearest physio dept*'.

Service-related barriers to the use of exercise were broader than simply difficulty accessing physiotherapy. Such barriers, described by 14 GPs included: pressure on GPs to reduce referrals, costs to patients of attending a gym (including transport), perceptions of limited or no availability of aqua-aerobics/hydrotherapy or local community exercise groups, and lack of integration of a physiotherapist with the GP practice team. Eight GPs who reported having experienced barriers indicated that services, specifically physiotherapy, did not meet their expectations. They reported dissatisfaction with appointment length, that the numbers of contacts with a physiotherapist were insufficient and that they perceive the provision of a leaflet of exercises to complete at home as inadequate physiotherapy intervention. Three GPs highlighted geographical barriers in patients undertaking exercise, either because patients live in remote locations which make accessing physiotherapy or the gym difficult or because the GP reported the local area is believed to be too unsafe to walk about in.

GP-related factors

Of the 815 GPs who reported previously having experienced barriers to using exercise, barriers relating to GP-factors were generally related to their skills and included: insufficient expertise (42%), uncertainty about the most appropriate types of exercise (27%) and inability to access the necessary resources (e.g. written information) (<1%) (see Figure 6-4). Of GPs who reported using exercise but could not use general or local exercises when they would like to, 52% (14/27) and 86% (65/76) of GPs reported insufficient expertise to be the reason, respectively. There was consensus agreement (78%) that exercise for CKP is more effectively provided by physiotherapists than GPs.

Patient-related factors

Of the 815 GPs who had previously experienced a barrier to the use of exercise, 36% reported that patients prefer other management options (e.g. medication '*they want the pills!*') and 3% believed that exercise does not match patient needs and/or expectations (e.g. '*patients often say they don't have time or it makes it worse*', '*...feels physically unable to exercise*', '*...often want a "quick fix"*').

Testing the association between GP's beliefs about capabilities and use of exercise

Testing associations with exercise: service-related factors

Beliefs about having enough time to manage people with CKP were not significantly associated with the use of exercise; 87% of those agreeing used exercise compared with 86% of those neither disagreeing or agreeing (OR 1.07 (0.66, 1.74)), and 91% of those disagreeing (OR 1.63 (0.81, 3.29)). Similarly there was no significant difference in the use of exercise among those agreeing (87%; OR 0.67 (0.30, 1.50))

or those disagreeing (91%; OR 1.00 (0.33, 3.01)) that time constraints prevent GPs from providing advice on individual exercises for CKP when compared to the use of exercise among those neither disagreeing nor agreeing (91%). Use of exercise among those agreeing (87%; OR 0.69 (0.34, 1.42)) and disagreeing (92%; OR 1.17 (0.34, 4.00)) that exercise for CKP would be used more frequently if access to physiotherapy was easier, was not significantly different to that among GPs neither disagreeing nor agreeing to the statement (90%). Finally, no significant difference was identified in the use of exercise among those reporting experience of insufficient time in consultations as a barrier (88%; OR 1.10 (0.73, 1.65)) when compared to those who have not experienced this (87%), nor among those reporting experience of difficulty accessing physiotherapy (86%; OR 0.85 (0.56, 1.30)) compared to those who have not experienced this (88%). The number of GPs reporting geographical problems (n=3), that services do not meet expectations (n=8) and limitations to accessing services (n=14) as barriers were too small to allow for a meaningful test of association with the use of exercise.

Given that time appeared to be such a prominent issue for GPs, yet it did not seem to affect their use of exercise, it was hypothesised that the perception of time limitations may not impact on whether exercise was used but how it was employed. *A posteriori* analysis tested the association with agreement with '*time constraints prevent GPs from providing advice on individual exercises for CKP*' with general and local exercise delivery methods (see Table 6-31 and Table 6-32). While general exercise delivery methods were not significantly associated with beliefs about time constraints, delivery of local exercise appeared to be influenced; in particular, GPs were much more likely to demonstrate local exercises if they disagreed that time

constraints prevented GPs from providing advice on individual exercises. Those who agreed with this statement were more likely to just provide a leaflet about local exercises.

Testing associations with exercise: GP-related factors

Use of exercise was significantly reduced among GPs having previously experienced, as barriers to exercise use, uncertainty about the most appropriate exercise to use (78%) when compared to those who had not (91%; OR 0.38 (0.25, 0.58)) and those who had felt they had insufficient expertise to give detailed information (83%) compared to those who did not (91%; OR 0.50 (0.33, 0.76)). The number of GPs reporting that they have experienced barriers such as being unable to access necessary resources to support exercise advice provision (n=3), being unclear about what physiotherapy offers (n=1) and not prioritising exercise (n=1) as barriers to using exercise was too small to allow for meaningful tests of association. Beliefs about whether exercise for CKP is more effectively provided by physiotherapists than GPs were not significantly associated with the use of exercise. However, there was a trend towards increased exercise use among GPs who disagreed with this statement (94%, 2.05 (0.57, 7.45)) and reduced exercise use among GPs who agreed with this statement (86%, OR 0.77 (0.42, 1.40)), when compared to exercise use among GPs who neither disagreed nor agreed with this statement (89%).

Table 6-31 Association between perception of time constraints and delivery method for general exercises

Time constraints prevent GPs from providing advice on individual exercises for CKP	General exercise initiation method							
	Does not suggest, give leaflet nor refer	Refer only	Leaflet only	Suggest only	Leaflet and refer	Suggest and refer	Suggest and leaflet	Suggest, leaflet and refer
(Strongly) disagree (n=61)	5%	2%	16%	**44%**	7%	8%	16%	2%
Neither disagree nor agree (n=62)	2%	7%	**31%**	27%	10%	8%	13%	3%
(Strongly) agree (n=529)	1%	13%	23%	**29%**	8%	7%	14%	5%

Pearson Chi-squared = 20.974, df 14, p=0.102. Most common exercise delivery mode for respondents with each attitude highlighted in bold. CKP = chronic knee pain; GP = general practitioner

Table 6-32 Association between perception of time constraints and delivery method for local exercises

Time constraints prevent GPs from providing advice on individual exercises for CKP	Local exercise initiation method							
	Does not demonstrate, give leaflet nor refer	Refer only	Leaflet only	Demonstrate only	Leaflet and refer	Demonstrate and refer	Demonstrate and leaflet	Demonstrate, leaflet and refer
(Strongly) disagree (n=69)	3%	7%	15%	**42%**	4%	3%	23%	3%
Neither disagree nor agree (n=64)	3%	11%	27%	**27%**	6%	3%	16%	8%
(Strongly) agree (n=492)	1%	17%	**25%**	22%	5%	5%	21%	5%

Pearson Chi-squared = 26.599, df 14, **p=0.022**. Most common exercise delivery mode for respondents with each attitude highlighted in bold. CKP = chronic knee pain; GP = general practitioner

Testing associations with exercise: patient-related factors

The use of exercise among GPs who reported patients preferring other management options as a barrier to the use of exercise (90%; OR 1.41 (0.90, 2.21)) was not significantly different from those who had not experienced this (86%). Exercise use was also not significantly different among those who had experienced exercise not matching patients' needs and/or expectations (87%, OR 0.97 (0.28, 3.31)), compared with those who had not experienced this barrier (87%). The number of GPs reporting having experience of difficulties in eliciting behaviour change in patients as a barrier to the use of exercise was too small (n=9) to allow a meaningful test of association.

Summary of the impact of beliefs about capabilities on the use of exercise

Table 6-33 demonstrates the responses relating to beliefs about capabilities that were associated with the use of exercise. Only GP-related factors appeared to be associated with the GPs' reported behaviours.

Table 6-33 Association of elements of the underpinning model with the use of exercise: beliefs about capabilities

Item(s) in study questionnaire relating to beliefs about capabilities	Significant association with use of exercise Odds ratio (95% CI) if significant	Comment
Service related factors		
Agreement that GPs have enough time to manage patients with CKP	✘	Disagreement not significantly associated*
Agreement that time constraints prevent GPs from providing advice on individual exercises for CKP	✘	Disagreement not significantly associated*
Agreement that exercise for CKP would be used more frequently if access to physiotherapy was easier	✘	Disagreement not significantly associated*
Prior experience that there is insufficient time in consultations as a barrier to using exercise	✘	
Prior experience of difficulty accessing physiotherapy as a barrier to using exercise	✘	
GP-related factors		
Prior experience of being uncertain about the most appropriate type of exercise to use as a barrier to using exercise	0.38 (0.25, 0.58)	
Prior experience of having insufficient expertise to give detailed information as a barrier to using exercise	0.50 (0.33, 0.76)	
Agreement that exercise for CKP is more effectively provided by physiotherapists than GPs	✘	Trend towards increased use of exercise among those who disagree and decreased use among those who agree
Patient-related factors		
Prior experience that patients prefer other management options as a barrier to using exercise	✘	
Prior experience that exercise does not match patient needs and/or expectations	✘	

*Compared with use of exercise among those responding with neither disagree or agree. CKP = chronic knee pain.

6.3.6.7 Influences on behaviour: behavioural intention

Although only 15% of GPs disagreed that managing patients with CKP is of clinical interest to them, only 40% agreed. No significant association was found between the use of exercise among those who agreed (90%, OR 1.58 (1.00, 2.50)) or disagreed (87%, OR 1.13 (0.63, 2.03)) that managing patients with CKP is of clinical interest to them compared with those who neither disagreed nor agreed (85%).

Similarly no significant association was found between the use of exercise among those who agreed (91%, OR 1.39 (0.82, 2.35)) or those that disagreed (83%, OR 0.72 (0.43, 1.23)) that managing patients with CKP is a priority for them compared with those who neither disagreed nor agreed (87%); although there was a trend towards reduced use of exercise among those that disagreed compared to those that agreed, see Table 6-34.

Table 6-34 Association of elements of the underpinning model with the use of exercise: behavioural intention

Item(s) in study questionnaire relating to behavioural intention	Significantly associated with exercise use Odds ratio (95% CI) if significant	Comment
Motivation and goals		
Agreeing that managing patients with CKP is of clinical interest to me	✘	Trend towards increased use among those agreeing it is of interest
Agreeing that managing patients with CKP is a priority to me	✘	Trend towards increased use among those agreeing it is a priority and decreased use among those who disagree

6.3.6.8 Influences on behaviour: habit or past behaviour

Habit or past behaviour was not systematically assessed as this would have involved questioning GPs about their historical management or assessing this in an alternative way, such as record review of their management or management of previous patients. However, some results did indicate habit was influencing the behaviours of GPs, particularly with regards to use of the term '*wear and tear*' ('*I know this is no longer advised explanation but I can't stop myself...*') and the use of knee x-ray to investigate the patient ('*Hard to drop this habit – research suggests is poor*').

6.3.7 Establishing the appropriateness of the analysis approach

In the presence of the unexpected finding that exercise use was often lowest in the presence of uncertainty (or ambivalence), that is, among GPs who neither disagreed nor agreed with attitude statements, the appropriateness of the analysis approach, to compare exercise use of those who agreed and those who disagreed with those who were ambivalent/uncertain was tested. *A posteriori* sensitivity analysis (223,226,379) comparing exercise use among only those who agreed with those who disagreed (i.e. excluding ambivalent responders from analyses) was undertaken using the MOVE consensus-derived attitude statements (see Table XXX-E and Table XXX-F in Appendix 30) and the adapted PABS-PT (see Table XXX-G and Table XXX-H in Appendix 30). These analyses revealed no significant differences from the previously identified associations between exercise use and attitude. While the statistical significance was altered on seven items across all four tables, this did not substantially affect the interpretation of the original results.

6.4 Discussion

The primary findings and associated literature are discussed in this chapter. Recommendations arising from this work are discussed in Chapter 7.

6.4.1 Summary of key findings

The primary aim of this research was to establish the proportion of GPs who use exercise in the management of CKP. The majority (87%) of GPs reported that they would use exercise of any type in the management of the vignette patient presenting for the first time with CKP and nearly half reported that they would refer the patient to physiotherapy. Notably, despite the high use of general exercise and the

recognition that the patient was obese, referrals to exercise programmes, weight management or lifestyle services were uncommon. Although just over half of GPs used all three core treatment strategies (weight loss, exercise and provision of written information or footwear advice), nearly a quarter (22%) of GPs used a treatment strategy that is currently not recommended by NICE (2) for the management of the vignette-patient. This is potentially problematic, not only through use of treatment without good evidence, but because using treatments that are not recommended uses precious time in the consultation (which GPs report is already insufficient) and distracts focus away from evidence-based treatments.

In line with evidence-based recommendations, most GPs reported that they would use exercise of some type and three quarters of GPs using exercise stated that they would use both local and general exercises. However, few (17%) of those GPs using both general and local exercise (n=535) did so in a way that is in line with evidence-based recommendations and the minimum expected roles of GPs, previously outlined in Section 2.6.3.5 (they advised, or referred for, local and general exercise and provided written information for both exercise types). This proportion represents only 11% of the 835 respondents, suggesting that there is an evidence-practice gap in the way in which exercise is initiated by GPs. Most commonly suggested general exercises were swimming, walking and cycling. Referral for both exercise types alone was reported by very few (n=32, 6%) of the 535 GPs using both exercise types; this is positive as this approach makes a delay to commencement of exercise inevitable, may not represent the best use of available services if this is representative of the GPs' approach for all patients and relies upon the receiving service implementing best-evidence recommendations. Most GPs did not provide clear evidence that they would attempt to tailor exercise advice to the individual

patient, only 3% of GPs offered the response that their general exercise advice needs to be tailored to their patients' interests and abilities, and supporting written information was only provided by around half of GPs initiating each type of exercise.

Although GPs generally believe CKP is of low priority and little clinical interest, overall GPs do believe they have a role in managing CKP in general and the beliefs of most GPs were generally aligned with the minimum expected role described in Section 2.6.3.5, that is that it is reasonable to expect GPs to be equipped to deliver at least basic advice about exercise. However there was great variability and lack of clarity about the role of GPs in following-up patients to ensure they are continuing to undertake exercise. Although two-thirds of GPs using exercise stated that they would follow-up the patient to check they were undertaking their exercise programme, only a third of respondents agreed that GPs should follow-up patients to ensure that they are undertaking their exercises and most GPs placed the responsibility of exercise adherence on the patient. Only two in five GPs reporting that they had received postgraduate training regarding CKP and only a third of GPs had read the NICE guideline, indicating a real possibility of lack of knowledge of evidence-based recommendations. Descriptions of CKP often deviated from the recommended approach suggested by NICE (2) and the majority of GPs use the term wear and tear, or related terms, to explain the diagnosis of CKP. However, there was overall agreement among GPs that exercise should be used for patients with CKP, and most GPs agreed that CKP would be improved by both local and general exercises. GPs appeared less certain about the safety of exercise compared with the efficacy of it and generally less certain about the value and safety of local exercises compared with general exercises. GPs were uncertain whether local or general exercise would stop CKP getting worse and about the suitability of

exercise for all patients with CKP (e.g. see the low proportion of agreement with '*exercise works just as well regardless of the amount of pain they have'* and '*exercise is effective if knee x-ray shows severe knee OA*' in Table 6-12).

Investigation of associations between attitudes and beliefs and the behaviours of GPs identified that beliefs about consequences (particularly having awareness of relevant guidelines, agreeing that exercises will help CKP and are safe, having a high behavioural treatment orientation score and believing that the underlying knee joint damage is not severe) were associated with an increased use of exercise. Social influences of other GPs were not associated with the use of exercise; although investigation of this and other social influences was limited. GPs' moral norms and perceptions about their role in including exercise into the management plan of a patient with CKP were associated with their use of exercise. The only GP characteristics associated with an increased use of exercise, were being female and reporting to be a GPwSI, among the latter, all used exercise (n=50). Patient and service-related factors regarding beliefs about consequences did not seem to influence the use of exercise, although service-factors may alter the way that exercise is initiated, for example a perception of insufficient time was associated with using leaflets or referring the patient to other professionals. GP-factors relating to beliefs about capabilities were associated with the use of exercise; specifically, uncertainty about the most appropriate exercise to use and insufficient expertise reduced GPs' use of exercise.

While GPs' positive attitudes, such as beliefs that exercise is safe and effective, were associated with an increased use of exercise, a reciprocal effect was not always seen among those who had negative attitudes. Many of the responses to the

suite of attitudinal items seemed to suggest high levels of uncertainty amongst GPs, with many responses in the centre of the Likert response options (indicating GPs neither disagreed nor agreed). The lowest levels of exercise use were commonly identified among the GPs indicating uncertainty, see Table 6-20.

6.4.2 Contrasting findings with previous literature

6.4.2.1 Use of exercise

The proportions of GPs reporting to use exercise and referring to physiotherapy were consistent with higher estimates found within other physician-report questionnaire studies identified in the systematic review (outlined in Section 3.4.3) which identified that between 9-89% GPs reported advising exercise and 10-77% reported referring patients with CKP to physiotherapy. Use of exercise in the present study also exceeded the use of exercise for other musculoskeletal sites. For example previous work reports that exercise is suggested by 17% of GPs for hip pain (313) and 30-60% for shoulder pain (380). Physiotherapy referral is undertaken by 14% GPs for LBP (313,381), 16% for new neck pain (381), 23% for non-traumatic arm, neck and shoulder complaints (209) and 57-74% for shoulder pain (380).

The most common general exercise suggestions (swimming, walking and cycling) were appropriate, particularly as walking tends to be most acceptable to patients (93), is relatively low impact, easily accessible, improves function (382), is adaptable to patient preferences and can be incorporated into usual daily living. However, it is unclear how acceptable or realistic it is for patients with CKP to commence cycling or swimming, particularly as having to pay (e.g. for equipment or instructors) has previously been identified as a barrier to participation with physical activity (78,383). Even with regards to walking, advice must be tailored to the patient's environment

(e.g. through perceived threats to safety). This issue, which was raised within the main study, was pertinent to previous work which has highlighted the impact of perceived safety on physical activity among older adults (384).

In the current survey the vignette patient had no comorbidities, many GPs perceived her pain and underlying knee damage to be moderate and she was relatively young and active. Previous work suggests the presence of comorbidities (259), older age (210,259,385), significant functional limitations or severe symptoms, may reduce the use of exercise. This may be particularly problematic as patients with CKP and comorbidities are at higher risk of functional limitations than those without (386), and the risk versus benefit of exercise in patients with single and multi-joint OA, with and without comorbidities is consistently in favour of exercise above other management approaches (387). Indeed, even small increases in exercise can have proportionally greater benefit to all-cause mortality among those with the lowest levels of fitness and activity, compared with those with higher levels (388). Given that many responding GPs demonstrated uncertainty about the efficacy and safety of exercise for all patients, the use of exercise identified within the present survey which used an uncomplicated patient vignette (i.e. no comorbidities, generally fit and active), may over-estimate the use of exercise among all patients with CKP. Further, of the 494 GPs who reported that they would use follow-up to check the vignette patient's adherence to exercise, 61% stated they would undertake this follow-up opportunistically. It is likely that this also represents an optimistic estimate of the extent of opportunistic follow-up. Previous research examining the consultation behaviour of patients with CKP has shown that, while many patients may consult again with their other health problems, the patient's CKP is often not recorded as

being mentioned again even when the patients perceive CKP as one of their most important health problems (75).

6.4.2.2 Referral for exercise

The high frequency of use of physiotherapy observed in the present survey is consistent with previous work which found that GPs perceived physiotherapists to be more useful than weight-loss clinics and software/website tools, with only fitness centres being deemed more useful than physiotherapy for managing obesity (389). This potentially missed opportunity to get patients specialist, targeted support, particularly in the face of the reported difficulties in accessing physiotherapy, may arise from greater familiarity with the local physiotherapy services than other weight-management or lifestyle services, that may have only been introduced more recently (68) or that GPs perceive that referring to physiotherapy is more socially acceptable than referring to lifestyle or weight-management services (390). Indeed, a primary care database study has revealed that 90% of overweight patients have no record of having been offered weight-management interventions (391).

6.4.2.3 Attitudes about CKP in general

The finding that GPs regard CKP as a low priority or of little clinical interest is not new (104,392,393). Indeed, patients have reported HCPs viewing OA as low priority (394) and other musculoskeletal conditions, for example, LBP are also viewed as low priority by GPs (395). Potential reasons include; lack of financial incentives for providing high quality care (such as those related to the UK Quality and Outcomes Framework (QOF)) (194), the belief that other conditions may have higher priority than CKP, the presence of comorbidities among patients with CKP that also require attention and management (248,271,396), or that GPs believe CKP to be a normal

consequence of aging (100,392) or that little that can be done for CKP (159,392,397,398). Previous work that has identified the potential consequences of GPs normalising CKP may be patients' interpretation that they are being 'fobbed off' or that nothing can be done (109,399), and hence patients may develop negative beliefs about the candidacy of CKP. The associated finding of the frequent use of the term 'wear and tear' to describe CKP also supports previous work. Paskins et al (400) identified that GPs used wear and tear more frequently than they realised. The ongoing use of this term is intriguing as it has long been discouraged (401) for being inaccurate and simplistic, not least because it implies that given adequate longevity, eventually everyone would develop the problem (4). It also neglects the likely inflammatory and reparative processes that are considered in the pathophysiology of the condition. Even the finding that the phrase was used despite acknowledgement that it was suboptimal is not novel (394). However, use of the term '*wear and tear*' was not associated with GPs' use of exercise, suggesting the term is not a proxy for GPs' negative beliefs about exercise. Potential benefits of using the term are that it may be familiar and understandable to patients, makes the underlying diagnosis seem less threatening, avoids medically labelling the patient and possibly saves time (109,158,392,396). However, concerns about ongoing use of the term '*wear and tear*' are due to some patients preferring a medical diagnostic label and interpreting it as their problems being dismissed (158) or normalised, which communicates that little or nothing can be done (159), for example because it is a part of the process of aging (83,100,157,158), that the situation cannot be reversed or improved (87,96,99,158), that '*the body is breaking down*' (158), and/or the patient's '*worn*' knee may become further damaged by continuing wear' (87). Thus there is a risk that '*wear and tear*' may negatively influence patients' future

attitudes, beliefs and behaviours (109), which may, in turn, undermine any exercise advice provided and reduce their use of exercise (98,109), although this outcome is not inevitable (83).

6.4.2.4 Beliefs about consequences of exercise

Only one-third of GPs reported that they had read the NICE OA guideline compared to 58% in a similar GP survey investigating attitudes about adding OA as QOF domain (330). The significant but small association between the GPs having read the guideline and the use of exercise observed in the current survey is interesting given that in a previous study fewer than half of GPs who had read the guidelines believed it had changed their practice (330). Although the association observed in the present survey may simply be a common outcome arising from the responding GPs being generally motivated and well informed, it may suggest that exercise use could be further improved by better dissemination of evidence-based recommendations.

Having a higher behavioural treatment orientation subscale score was significantly associated with increased use of exercise. While this was aligned with the expected direction of association, the difference in use of exercise was small (82% and 90% of GPs with the bottom and top 25% of scores, respectively, used exercise). The value of the adapted PABS_PT in this context is discussed later in the chapter Section 6.4.4. The common finding that GPs were more positive about general exercise than local exercise is in contrast to physiotherapists in the ABC-Knee study, who were generally more positive about local exercises (175). In the present study only 56% and 71% of GPs agreed that quadriceps strengthening and general exercise are safe for everybody to do, respectively. Further, only 69% of

respondents believed GPs should prescribe local exercises to every patient with CKP, compared with 89% agreeing with the associated statement relating to general exercise. This is likely to be due to GPs being more familiar with initiating general exercise as this is a core treatment of many common conditions managed by primary care. This may indicate the need for GPs to be supported to find ways to provide specific and individualised advice for both types of exercise for CKP.

6.4.2.5 Social influences and moral norm

Moral norm was associated with the use of exercise and this is consistent with some of the previous work outlined in Appendix 2 (143,145). However, there was no clear evidence that the use of exercise for CKP by GPs was influenced by the views or practice of their GP colleagues. The most frequent destination for referral by GPs was physiotherapy, suggesting that of the various professional groups, this may be the group who have most social influence on GP practice in this context. If this is the case then the beliefs about exercise highlighted by Holden et al (175) suggests that attitudes and beliefs about exercise may not be strengthened by the effect of physiotherapists who appeared less certain than GPs about the value of exercise, specifically general exercise, for this patient group. However, the physiotherapist data from the ABC-Knee study was collected over seven years ago, which was around the time when the first NICE OA guidelines were published (48). The data from the present study were collected when the NICE guidelines were more established and the survey mailing period coincided with the publication of the updated guidelines (2). Another potential reason that social influences were not found to be associated with the behaviour of GPs is that the item asking about GP colleagues was too broad. GPs may be more likely to be influenced by individuals

that they trust or relate to (402); therefore it may be necessary to establish whether specific people influence their behaviour rather than groups of people in general terms. Aside from the item in the main survey study tool asking about GPs' experiences of barriers, there were no items specifically asking GPs about their perceptions of the extent to which other groups influence them (133). There is some indication that GPs are influenced by patients, for example 22% of the 564 GPs using knee x-ray to investigate the vignette patient reported to do so to reassure the patient, this was not the predominant reason for use of knee x-ray (which was to confirm the diagnosis). Thus there is insufficient data to draw strong conclusions regarding the impact of social influences on GPs' use of exercise for CKP.

6.4.2.6 Role and identity

GPs' perceptions of their role were generally in line with the minimum expected role outlined in Section 2.6.3.5. These results are similar to those from a survey of Dutch GPs investigating their perceived role in initiating exercise among their general patient population, which reported that half felt they had an important role and the remaining GPs acknowledging they had a role but that this is limited (403). Similar to their moral norms, GPs' perceptions about their role in initiating exercise in the management of a patient with CKP were significantly associated with their use of exercise. The impact of role on behaviour has been identified previously (152) and it may be significant that the roles of GPs, or any potentially involved HCP, in providing exercise for patients for CKP are not clearly defined. The associated risk of '*collusion of anonymity*' (190) was indicated by the lack of clarity about following-up patients to ensure continued adherence with exercise. When GPs wanted to follow-up patients in a planned way, one in ten suggested they would ask someone

else to do this, primarily, physiotherapists were the professionals highlighted to undertake this role. Similarly Clarson et al (168) identified that a third of GPs believed monitoring of OA should be undertaken in secondary care. Interestingly, although physiotherapists also see the value in follow-up of patients to ensure continuation of exercises, they too do not necessarily see this as their role and also place the responsibility of continuing exercises on patients (175). The impact of this lack of clarity of the expected roles of GPs may be significant, particularly considering the strength of association between GPs' beliefs about their role and their exercise use and because patients' non-adherence to exercise over time is a significant problem (78).

6.4.2.7 Characteristics of the GP

Among all the characteristics of GPs that were studied, only two (gender and being GPwSI) were significantly associated with the use of exercise. While this is in contrast with previous work that has demonstrated that exercise use for patients with CKP has not been explained by physician factors (235), the absolute difference in the proportions of males using exercise (85%) compared with females (90%) was only small. However, as characteristics of GPs may not only be associated with the use of exercise for CKP but also with decisions regarding survey participation, it is possible that associations based on characteristics of the GP may be weakened by the low response rate.

6.4.2.8 Beliefs about capabilities

Service-related issues relating to beliefs about capabilities were raised frequently throughout the survey, specifically relating to time and access to services which support exercise. These issues are not new, one study demonstrated that there is

insufficient time for GPs to manage the ten most common chronic illnesses when they are stable and controlled (212). Further, it is known that other problems are often managed in the same consultation as CKP (240,396); in a recent study of routine GP consultations, on average more than two problems were dealt with at each consultation (404). Up to half of GPs feel that they have insufficient time to promote physical activity to their patients in general (not just those with CKP) (403,405). Physiotherapists and patients have also reported a suboptimal availability to physiotherapy (394). While overall perceptions or previous experience of problems relating to these issues did not significantly influence the use of exercise among GP respondents in the current study, there was some evidence these issues may impact on how exercise is initiated.

In line with previous work (104), GPs reported negative attitudes about the capacity and motivation of patients to undertake exercise. This is not surprising in view of the varied comorbidities which may impact CKP patients' perception of their ability or motivation to undertake exercise (19,248,406). Many barriers to exercises have been raised in the present survey and previously identified including lack of self-efficacy, poor body image, poor time management and lack of social support as well as exercise scheme barriers such as intimidating environments, inadequate supervision, and inconvenient opening hours (101). Some GPs also recognised that exercise does not match the needs and expectations of some patients and HCPs beliefs that patients with knee OA want '*quick fixes'* have been previously documented (221). Potentially this may be due to patients frequently attending with an acute flare of their symptoms (12,75). However, patient-related factors did not appear to significantly affect GPs' use of exercise. This may be because, even when GPs have experienced negative patient attitudes about exercise, they may have

also experienced patients having positive views about, and experience of, exercise (54,87,269) and regardless of whether GPs feel that patients will exercise or not, GPs may feel that they have discharged their duty of care by relaying this information and that it is the patient's decision whether or not to follow their advice. However, it is possible that these results, in addition to some of the strongest associations with exercise use being found among beliefs about role and moral norm, may indicate an inadequate level of patient-centeredness among GPs, thus potentially risking insufficient focus on the individualisation of exercise initiation.

6.4.3 Phenomena which were not explained by the underpinning theoretical model

Some elements of the underpinning model were insufficiently investigated because there was lack of focus within the questionnaire, for example: social influences and habit/past behaviour. However, some phenomena identified from the results could not be well explained by the underpinning theoretical model, namely: the use of management approaches for which GPs believe there is little or no evidence of benefit and the similarity of exercise use among GPs with positive and negative attitudes about the safety and efficacy of exercise. These are now considered in more detail.

6.4.3.1 The use of management approaches for which GPs believe there is little or no evidence of benefit

Use of exercise in the presence of negative beliefs about its safety or efficacy may be explained by external influences on the GPs' behaviour that were not measured by the questionnaire survey, for example, patients requesting a specific type of treatment approach (social influences). Patient requests were not depicted within

the vignette or explicitly within the underpinning model, however, as outlined above and by Arshad et al (238), GPs do act on patients' requests (e.g. when undertaking investigations). While realistically investigating a variety of contexts using a questionnaire survey is possible, it would have made the tool longer. However, the lack of detail about the patients' ideas and expectations and the associated phenomenon of GPs using unrecommended approaches may underline the need to understand the full context when trying to understand GP behaviours (131). Consistent with the premise of evidence-based medicine ('*it cannot result in slavish, cookbook approaches to individual patient care'* (407)) the impact of the patient's preferences and requests, and the expectation of partnerships between doctors and their patients may go some way to explain the difficulties in finding models that precisely predict and explain GPs' behaviour. While patients' attitudes, beliefs and behaviours regarding exercise for CKP were discussed in Section 1.3, and patient influences were conceptualised briefly in Section 2.6.2, the survey tool gave insufficient focus to patient factors within the social influences element of the underpinning theoretical model. Thus patients' requests and treatment preferences, and the impact of these, have not been systematically investigated. However, this omission would not have been able to explain the common finding of the lowest use of exercise among GPs who neither disagreed nor agreed about the safety and efficacy of exercise (see Table 6-20 and Table 6-21), this is now considered.

6.4.3.2 The similarity of exercise use among GPs with positive and negative attitudes about the safety and efficacy of exercise

The similarity of exercise use among GPs who had positive and negative attitudes about the safety and efficacy of exercise was in contrast with other work which has examined the impact of positive and negative attitudes and beliefs on behaviour

(152) and was apparently incompatible with the underpinning theoretical model. The most likely explanation for this unexpected finding is that GPs' uncertainty is a significant barrier to using exercise. Uncertainty was not explicitly contextualised within the study tool, although it can be argued that it lies within the beliefs about consequences element of the underpinning model. Lack of explicit focus on the impact of uncertainty may have been a significant omission, as previous work has identified that GPs experience more uncertainty relating to guidelines than other medical specialty doctors (408). Future investigation of GP behaviours must therefore explicitly conceptualise the role of uncertainty.

Recommendations arising from this work and alternative ways of investigating and explaining GPs' behaviours will be considered in Chapter 7. The rest of this chapter focuses on the remaining aims of this survey, to establish the value of the adapted PABS_PT in the context of measuring GPs' attitudes about CKP and of the use of the electronic response option in a postal questionnaire.

6.4.4 The value of the adapted PABS_PT in the context of measuring GPs' attitudes about CKP

Although scores from the subscales of the adapted PABS_PT were associated with the reported use of exercise in the expected way (i.e. increased use of exercise among those with the top 25% of scores on the behavioural, and the bottom 25% on the biomedical, subscales), the difference in exercise between the top and bottom groups was small (8% and 6%, respectively (see Table 6-25)) and the association between biomedical treatment orientation and the use of exercise was not statistically significant. This is in contrast to previous work among GPs which has generally found the associations between the biomedical subscale and

behaviour to be more significant than the behavioural subscale (217,409). The most likely reason for the lack of statistical significance was the limited spread of scores for the biomedical subscale in the present survey compared to some other studies (SD current survey 4.9, in other studies 5.3-7.7 (217,296,312,409,410)) and the difference between the use of exercise among those with the top and bottom 25% biomedical scores was smaller than expected. While such a small difference may not be meaningful, the survey was underpowered to detect the observed difference as significant. An unexpected association between adapted PABS_PT subscale scores and the extent to which GPs' views were in line with guideline exercise recommendations was noted, both behavioural and biomedical subscale scores were highest in those most in line with recommendations. However the differences in treatment orientation scores was small between GPs with attitudes and beliefs in-line, broadly in-line and not in-line with current evidence-based exercise recommendations, so robust conclusions about this cannot be drawn. The lack of association between individual GPs' behavioural and biomedical subscale scores in this survey was not novel (410), however it was in contrast with previous work among GPs investigating sickness certification and LBP (217,296). In the current survey, the lack of association may be due to the clustering of values around the central scores. The reason for this is uncertain but, may be explained by previous applications of the PABS_PT among GPs usually being in the context of LBP (296,409,410). It is possible that the anxieties about LBP and CKP among GPs are different. For example, it is conceivable that LBP may be associated with increased concern among GPs due to the risk of permanent disability if a serious spinal pathology is missed, whereas the most serious diagnosis considered by respondents in the present survey was inflammatory arthritis. While inflammatory

arthritis is serious and can result in permanent disability, it does not require such urgent management as suspected cauda equina syndrome and it is known that GPs do not always manage inflammatory arthritis with the recommended urgency even when it is suspected (411). Following work undertaken by Watson et al (217), which found that some items within the behavioural subscale resulted in skewed responses and did not correlate with the total subscale score, some studies have used a reduced version of the subscale among GPs (312,409). This reduced version was not used in the present survey in order to ensure comparability with the previous physiotherapy study (175) and because even this reduced scale does not robustly predict GPs behaviours (409). Negative feedback from GPs about the inclusion of the adapted PABS_PT attitude statements in the present survey was received from some GPs from the pre-pilot stage to the main survey. Reactions to the adapted PABS_PT have included that it is '*repetitive*' (Section 4.3 and Appendix 8), '*daunting*' (Section 4.3 and Appendix 8), items are irrelevant to GPs (Appendix 8) and this has led to it being perceived as being unacceptable leading to non-response (Section 6.3.1). These, in addition to high levels of ambivalent responses in the pilot (Section 5.3.5.1) and main surveys (Table XXX-G and Table XXX-H in Appendix 30) and the suboptimal performance of the adapted PABS_PT when used in this context, suggests that further development of this measure of HCP attitudes and beliefs is required before it is further used with GPs in this context, or that alternative strategies to investigate clinically relevant beliefs about CKP may need to be identified.

6.4.5 The value of an electronic response option

Few GPs chose to use the electronic response option offered in the main survey. Those who did use it accounted for 6% of respondents, of which nearly half stated they would not have completed a postal version of the survey. Given such small increases in response obtained using this method, the value of the additional 2% (n=19) of responses would have to be weighed up against the cost of the subscription to the online survey software and the time taken to set it up, to establish whether it would be worth using again in the future. Given that the financial and time resource costs of setting up an electronic survey are fixed, the value of providing this type of response option is likely to be highest when used in larger questionnaire surveys.

6.4.6 Strengths and limitations

6.4.6.1 Strengths

This large UK-wide survey is the first to directly and specifically investigate the attitudes, beliefs and associated behaviours of GPs regarding CKP in a consistent and well-defined way. The concurrent investigation of attitudes/beliefs and associated behaviours is a significant strength as the underlying reasons for certain reported behaviours have been explained. The large national sample promoted identification of a breadth of experiences, mitigated against the impact of local differences in healthcare services and enabled reasonably robust investigation of the key associations between GP attitudes and behaviours.

The vignette-based nature of the questions investigating GPs' behaviours provided direction to GPs that helped them to focus their responses on relevant information,

and is likely to have provided at least an estimate of behavioural intentions (131). The validity of the vignette was supported as GPs diagnosed and interpreted the severity of the symptoms in an appropriate and consistent way. The vignette continued to align well to the criteria for a clinical diagnosis of CKP when the updated NICE OA guidelines were published part way through the survey (2). Although some free-text feedback suggested that some GPs felt the vignette was too simplistic, given that only one vignette case was included, the use of a vignette which did not involve comorbidities or pre-existing drug treatments eliminated the risk of confounding issues influencing the GPs management decisions. The similar estimations in use of exercise of any type obtained from the main survey (87%) compared with the pilot survey (85%) suggests that the alterations to the section of the questionnaire enquiring about the use of exercise, made between the two surveys, did not influence the way GPs reported their behaviour. The detailed approach used to identify exactly what GPs did to initiate exercise among patients with CKP was more comprehensive than any study identified in the systematic review.

The quantitative analysis approach used in the study was appropriate as confirmed by the sensitivity analyses described in Section 6.3.7. The sensitivity analysis addressed a risk that differences in behaviours between those who agreed and those who disagreed may have been masked. This risk was not substantiated, and no significant associations between attitudes and behaviours were obscured by the original analysis approach.

6.4.6.2 Limitations

The primary limitation of this survey is the low response. Reduced response compared to the pilot survey may have been due to the undesirable timing of the survey mailing, which coincided with the end of the financial year and thus a time when achieving incentivised clinical targets becomes more pressing. Response bias is likely and thus responses are likely to over-represent the GPs who are more interested and knowledgeable about CKP (256,257,339); this may be indicated by 6% of the GPs responding reporting to be GPwSI in musculoskeletal conditions (see Table 6-4). Following examination of the characteristics of respondents and non-respondents, the results may over-represent the views of those who practice in areas of lower deprivation and who are more newly qualified. Therefore, not only may the low response reduce the generalisability of results, it is likely to have over-estimated the use of exercise by GPs. By way of example of the potential over-estimate of exercise use; if the responding GPs who reported using exercise (n=729) were the only GPs in the entire sample of potentially eligible GPs (n=4942) who would use exercise, the reported use of exercise would be 15%. It is unlikely that this extreme example is the reality but the actual proportion of GPs using exercise among the general GP population probably lies between 15% (the worst case scenario described) and 87% (the use of exercise identified by the main survey).

Despite the number of GPs returning questionnaires exceeding the 748 calculated to be required, a further consequence of the low response is the survey was probably underpowered to confidently detect a difference in exercise use according to treatment orientation. The observed difference in exercise use (6-7%) between

those GPs in the upper and lower 25% of scores was smaller than the difference assumed for the sample size calculation (15%). Unfortunately, due to the error with the Likert scale used within the adapted PABS_PT in the pilot study (see Section 5.3.6.3), a difference in scores was assumed rather than being estimated from the pilot results. Using the observed use of exercise in the sample size calculation suggests that around 2000 responses would have been necessary to adequately power the survey to establish statistical significance for the observed difference in exercise use according to treatment orientation.

The slightly greater proportion of responding GPs being female may have led to an over-estimate of the use of exercise among the general GP population as females were found to be more likely to use exercise. The proportion of females responding with a completed questionnaire was in excess of the proportion of GPs who are female (~50%), but is more consistent with the female preponderance among newer GPs (412).

The broad definition of exercise used, which included GPs selecting the multiple response option '*exercise*' or suggesting referral to physiotherapy or an exercise programme in the management of the vignette patient, may have over-estimated GPs' use of exercise for CKP for two reasons: 1) if GPs were referring to physiotherapy for reasons other than exercise, and 2) if GPs were referring to exercise programmes to manage the patient's weight rather than her CKP. While the potential for over-estimates arising from the first point cannot be determined, any over-estimates arising from the second point are likely to be small, as only 17% of GPs using exercise did not include local exercises within this plan (see Figure 6-2).

Inherent in questionnaire surveys is the risk of social desirability bias (279,413). In the context of the current study, this may lead to GPs reporting what they know they should do rather than what they may actually do when in the clinical consultation. Related to this is the use of closed questions, which may serve to prompt GPs to provide responses that may not have occurred to them otherwise and thus may have led to overestimates of reported behaviour, as discussed in Section 5.4.2. This was reiterated when, for example, GPs' reported use of leaflets to advise about exercises in response to a closed question in the main survey was greater (305 (37%) would provide leaflets about general exercise, 325 (39%) about local exercise) than the proportion identified in the pilot study (3% would use a leaflet for exercise advice (see Table 5-12), 27% would provide written information (not specifically about exercise, see Table 5-15)), when asked using an open question. While the extent of social desirability bias using a questionnaire survey alone and the presence and extent of over-reporting of behaviours arising as a result of using closed questions cannot be ascertained, the worst case scenario is that the results from this survey estimate GPs' knowledge of what they think they should do and/or their behavioural intentions.

6.5 Chapter summary

This survey has identified that exercise was used by the majority (87%) of GPs to manage CKP, although the means by which this approach was included in the management plan was variable. While both general and local exercises were used by three quarters (74%) of the GPs using exercise of any type, only 17% of these GPs reported that they would initiate both types of exercise in a way that was aligned to evidence-based recommendations. Although GPs' attitudes and beliefs about

exercise for CKP were generally positive, particularly regarding general rather than local exercises, there was significant uncertainty about the safety and efficacy of local and general exercise among patients with CKP. The impact of GPs' perceptions of their role in initiating exercise appeared to be significant, in that the greater their perceived role in initiating exercise the greater the odds of them using exercise. Clarifying the role of GPs in initiating exercise and subsequently following-up patients to check for continuation of exercises thus appears to be a priority. Although elements of the underpinning model predicted behaviours as expected, some results suggested poor support for, and inadequate focus on, other elements. In addition, the value of the adapted PABS_PT used in this context was suboptimal, therefore alternative approaches may need to be devised to better characterise GP attitudes and behaviours in the future. The use of an electronic response option did not significantly improve overall response to this questionnaire survey. While the observed use of exercise by GPs may be an overestimate given the simple nature of the patient vignette, the likely response bias and the use of prompts in respect of using closed questions with details of potential management options, the results are of value in informing future management of CKP in primary care due to the presence of inexact alignment of reported attitudes, beliefs and behaviours with evidence-base recommendations. Recommendations for the future arising from this work are described in the next and final chapter.

7 GPs' attitudes, beliefs and behaviours regarding exercise for chronic knee pain: implications for the future

Each previous chapter of this thesis has discussed the key results of each component of the PhD programme. To briefly summarise, a systematic review was undertaken which identified relatively few studies that specifically investigated the attitudes, beliefs and behaviours of GPs regarding exercise for CKP. The studies identified were heterogeneous in design and, while indicating various levels of exercise use, attitudes and beliefs, they lacked specific information about the detail of exercise used by GPs. Therefore, after developing an underpinning theoretical model, a cross-sectional questionnaire survey was designed and piloted among 800 UK GPs, in an attempt to identify approaches that would maximise response and the quality of the data obtained. The pilot survey found that questionnaire length and offering an incentive did not influence response. The findings of the main survey were that while most responding GPs reported that they use exercise for CKP and most were positive about exercise, uncertainties about the safety and efficacy of exercise, particularly local exercise, for CKP were revealed. The value of the adapted PABS_PT to investigate GPs' attitudes about CKP was not proven. This chapter now brings these findings together by highlighting the evidence-practice gaps identified by this research and making recommendations for both clinical practice and future research.

7.1 Evidence-practice gaps identified

Results from the main survey indicated that although most GPs use exercise for CKP, there is an evidence-practice gap in the way in which GPs employ exercise for this patient group. This may result in untimely commencement of specific and

individualised exercises, particularly if GPs are not equipping patients to commence exercise upon leaving the consultation. Further, as highlighted in Section 6.4.6.2, this survey is likely to have overestimated the proportion of GPs using exercise and yielded results that may not to be fully generalizable to the wider UK GP population. Explanations for the underuse of exercise appear to arise from uncertainty among GPs about the safety and efficacy of (particularly local) exercise for CKP for all patients, perceptions that there is inadequate time in consultations (which appeared to affect the way in which exercise was initiated) and lack of clarity about the expected roles of GPs initiating exercise. Uncertainty (about the risks, efficacy, safety and correct types of exercise) and the perception of insufficient expertise (among over 40% of GPs), is perhaps not surprising when only 39% of GPs reported having received postgraduate education about CKP (see Table 6-4) and 61% of GPs have not read the current, relevant, NICE OA guideline (see Section 6.3.6). Further, GPs' descriptions of CKP were not well-aligned to recommended approaches and, due to the way in which patients may interpret these explanations, GPs' advice to exercise may be undermined by the language they use. The means by which clinical practice may be improved will be discussed in the next section before outlining recommendations for future research.

7.2 Recommendations for future clinical practice

To address these evidence-practice gaps, recommendations to improve future clinical practice include: (1) clarifying the minimum expected role of GPs in initiating exercise for CKP; (2) creating a succinct, accurate and acceptable description of CKP to be used by GPs; (3) developing a pragmatic approach for GPs to initiate specific and individualised local and general exercises in a time-limited environment;

(4) considering alternative management approaches that may improve exercise initiation and/or follow-up among patients with CKP; and (5) supporting better implementation of evidence-based recommendations in practice by identifying effective and acceptable educational approaches, organisational changes and behaviour change strategies. Each of these recommendations will now be considered in turn.

7.2.1 Clarifying the minimum expected role of GPs in delivering exercise for CKP

GPs' beliefs about their role in initiating exercise were strongly associated with their use of exercise. Therefore a logical first step to optimise care would be to agree a minimum expected role for GPs. While it may be unrealistic to expect the roles of all potential HCPs who may be involved in the care of a patient with CKP to be outlined within the practice guidelines, a professional body (e.g. RCGP or NICE) could use the national guidelines to clearly identify GPs' expected roles, in partnership with other relevant HCP professional bodies (e.g. Chartered Society of Physiotherapists (CSP), Royal College of Nursing, Royal College of Physicians, Royal College of Surgeons) to ensure consistency and completeness of identified roles. This type of approach is already alluded to by NICE in the OA quality standard (36) which lists supporting organisations including RCGP, CSP and the Primary Care Rheumatology Society. While certain aspects of the quality standard are explicitly aimed at GPs (e.g. '*adults aged 45 years or over who go to their GP with joint pain that is typical of osteoarthritis are usually diagnosed....without the need for an x-ray...*'), there is still scope within the current guidelines for the onus of responsibility to fall between GPs, allied health professionals and secondary care (for example, '*service providers (such as GPs, community healthcare providers and hospitals)*

ensure that systems and resources are in place for adults newly diagnosed with osteoarthritis...') (36). Once roles have been clarified, services and resources can be designed by clinical commissioning groups (CCGs) to support GPs to deliver them. Such information is currently missing from evidence-based guidelines and development of a widely accepted and achievable role for GPs may help to improve exercise use through avoidance of collusion of anonymity. The minimum expected role outlined in Section 2.6.3.5, could be a good start, as the majority of GPs believed their role to align with this. Expected roles could be disseminated through guidelines, Map of Medicine (414), quality standards or care frameworks; however, given that less than half of GPs have read the relevant clinical guidelines for CKP (see Section 6.3.6.1) simple dissemination alone is unlikely to result in significant changes. Indeed, no studies that solely looked at changing role beliefs were identified, instead, it seems more appropriate to link defining and disseminating expected roles of GPs with other interventions such as integrated templates outlining expected activities in the electronic medical records (see Section 7.2.5.2), pay-for-performance schemes (to incentivise GPs to undertake their expected roles, see Section 7.2.5.3) or through performance feedback (e.g. using audit, see Section 7.2.5.3).

7.2.2 Creating a succinct, accurate and acceptable description of CKP to be used by GPs

Descriptions used by GPs to explain CKP to patients often deviated from recommended approaches, for example 83% of GPs used terms relating to '*wear and tear*'. In addition to the potential negative interpretation by patients of '*wear and tear*' (see Section 6.4.2.3), the wide perceptions of time limitations reported by GPs suggest there is a value in supporting GPs to find succinct and accurate descriptions

of CKP that are understandable and acceptable to patients and that convey the messages that something can be done and exercise is helpful rather than harmful. This requires a shift away from describing CKP as a normal consequence of aging, describing it in terms of what it is not (i.e. '*it is not inflammatory arthritis*'), which can confuse patients (396,400), and changing the use of the term '*wear and tear*' (415,416) to something which is more accurate and informative and with a more positive implication. Indeed, Paskins et al (396) have also identified problems with the way that a diagnosis of OA is communicated and reported that patients '*wanted a clearer and more meaningful diagnosis'*. GPs are now encouraged to use terms relating to '*wear and repair*' and to support such simplified descriptions with explanations of the processes going on within the joint and thus how exercise addresses the underlying problems (399). A pragmatic approach to the description of CKP that includes the key elements of the NICE's definition of OA, could be adopted and is currently presented on a GP-targeted online learning module (417) and within the (freely available online) Keele OA guidebook (418). The suggested approach is that the condition affects the whole joint, increased stresses may further damage joints, joints are capable of repair, it does not inevitably get worse, different joints have different prognoses and there is something that can be done about it (417). The impact that clear communication of the diagnosis can have to equip and motivate patients to adhere to management strategies has been previously underlined in the context of asthma (419) and primary prevention and health promotion activities (420). Work should be undertaken to develop key and positive messages about CKP into a more user-friendly explanation for GPs to offer their patients. However, any phrases developed would have to be tested for acceptability among GPs and patients; particularly as previous work has identified that while more

precise, medical terms such as arthritis and osteoarthritis may be familiar to some patients, they can cause confusion for others (158). Once refined and agreed, such a standardised description could be included in all relevant evidence-based guideline recommendations, educational resources and curricula and patient information leaflets. As outlined by schema theory, changing routine approaches (scripts) to managing common situations can be cognitively demanding (421); therefore simply telling GPs not to use '*wear and tear*' through a one-off educational strategy is unlikely to be adequate. But inclusion of an accurate, agreed, accepted description of CKP within a regularly used patient information leaflet or patient management plan to support communication about the condition may support GPs to change their approach. This approach is familiar to GPs as, for example, the RCGP has a TARGET antibiotic reduction campaign through which they have published information leaflets and management plans to be used during communication with primary care patients (422). Signposts to standardised patient information leaflets and/or management plans could be provided within templates integrated into the electronic medical records (see Section 7.2.5.2).

7.2.3 Developing a pragmatic approach for GPs to initiate specific and individualised local and general exercises in a time-limited environment

Although GPs responding to the main survey generally provided appropriate suggestions for the implementation of exercise, the extent to which the suggestions were tailored to the individual patient was unclear but was likely to be insufficient. Previous work investigating primary prevention and health promotion identified that patients feel their independence is threatened and may reduce their adherence to advice they are given if they perceive a HCP to be '*trotting out the usual advice*'

(420). Therefore, when GPs are providing advice about exercise to patients with CKP, there are two elements they need to address; 1) communicating the value of exercise to that patient (i.e. considering comorbidities and priorities of the patient) and its role relative to the other management options and 2) agreeing specific and individualised local and general exercises. Given the relatively high use of exercise reported by responding GPs, the first element appears to be less of a problem than the second. However, GPs may be further supported in demonstrating the role and value of exercise through the use of tools such as the knee OA self-management options Option Grid (423); which demonstrates the relative qualities of lifestyle interventions compared with medications. Indeed, empirical work suggests that when patients are given adequate information about the harms of pharmacological management strategies they are more likely to select exercise as a management approach (424). However, it will require more effort to address the second element of exercise initiation, that is, the development of specific, individualised exercise plans. GPs are a heterogeneous population with varied interests, expertise and CPD activities, thus it is no surprise that uncertainty (about the efficacy, safety and use of exercise) and perceptions of insufficient skills were found. Given that a recent Cochrane review regarding exercise for knee OA suggests that doing any exercise (if undertaken regularly and monitored by a HCP) is likely to be better than doing nothing in the short-term (63), it seems logical that developing and disseminating a pragmatic approach to initiating exercise (and putting in place strategies to promote adherence (see Section 7.2.4.4.)) would assist all GPs to deliver evidence-based recommendations. Such an approach was suggested by Khan et al (198) who recommended that GPs ask about physical activity at each consultation, consider the '*5 A's*' of physical activity counselling (assess, advise, agree, assist and arrange)

(425), write a prescription for exercise (195,426,427), promote physical activity guidelines, refer to professionals (including physiotherapists, exercise physiologists or fitness instructors) who may support the patient in an appropriate exercise programme, become familiar with local activity resources and signpost patients to relevant supporting information (for example www.getwalking.org), and follow-up patients to identify and address progress and problems. Providing a supplementary patient 'guidebook' about the condition seems to be an acceptable and useful strategy to use (418,428). Given the frequency with which CKP patients present with other comorbidities (93,240,271,396) and co-existing pain in other joints, the potential consequences of exercise for these patients may be even greater than those described in relation to CKP alone (75). However, the presence of comorbidities is associated with reduced engagement with exercise (429). GPs could use the CKP consultation to detect and manage comorbid conditions that may directly impact the use of exercise (e.g. depression (430)), to relay the synergistic benefits of exercise for CKP and its comorbidities, to make explicit that CKP does not need to be a barrier for exercise for other conditions and that exercise most benefits the most inactive members of the population, among whom even small increases in activity can reduce mortality (62).

Feasible methods to help GPs provide the above information in the available consultation time are required. This may involve changes to service delivery approaches (e.g. use of personalised written care plans (193)), or using alternative strategies, which may involve a package of care over time in which these elements are eventually incorporated or through development of wider services which GPs can refer into to deliver this type of care. Before this can be developed, expected roles of GPs (and other HCPs) must first be identified, as described above. Given

that only a third of GPs responding to the main survey agreed it is part of their job to provide patients with CKP with a written management plan (see Figure 6-6), feasibility and acceptability testing of this type of strategy would be essential. Barriers to any GP-led change or intervention will be their level of (perceived) skill and their uncertainties. Indeed, uncertainty was frequently associated with underuse of exercise (see Table 6-20 and Table 6-21). Therefore possible alternative management approaches for both non-GP-led exercise initiation and follow-up, and educational, behavioural and organisational change strategies to support GP-led care are described in the following sections.

7.2.4 Considering alternative management approaches that may improve exercise initiation and/or follow-up among patients with CKP

GPs' common perception of limited time for exercise initiation or follow-up impacted the way in which local exercise was initiated among survey respondents. Although GPs may extend consultations to the time necessary to provide required management (186), this is not optimal or sustainable for health problems as prevalent as CKP. Given the uncertainties identified about the value and safety of exercise, and the impact that prior experience of uncertainty about the best types of exercise had on the use of exercise, one option to improve the use of exercise is to address the uncertainties among GPs (this is discussed in Section 7.2.5), another is to move care to other HCPs. Previous work has suggested that development of a clearly defined set of standardised consultations for primary care rheumatologists to deliver to patients with OA (supported by written and verbal information for patients and weight and physical activity monitoring), can improve physical activity and pain (431). However, it would neither be appropriate, feasible or cost-effective for rheumatologists to provide the care for all patients with CKP in the UK, nor is it

likely that GPs would have the capacity to deliver such a comprehensive model of care (432). The model of using standardised consultations in primary care has been tested and is discussed in Section 7.2.5.1. Therefore, care of patients with CKP may need to be transferred to alternative professional groups. The obvious choice is to place primary management of CKP with physiotherapists, as this was the professional group that responding GPs most frequently referred to. Other care providers that may also be able to take on this responsibility include practice nurses (PNs), health trainers (HT) and staff within local gyms. Another option may be to place advice and self-management support within the community, before patients even make contact with formal services, through targeted public health messages and campaigns designed to inform patients about the nature of CKP and the steps they can take to reduce pain and improve functioning. New management approaches to improve adherence may also be required. These suggestions will now be considered in more detail.

7.2.4.1 Placing primary management of CKP with physiotherapists

Evidence suggests that CKP patients involved in a physiotherapist-led rehabilitation programme do better than those managed by GPs alone (393). However, results from the current research and the ABC-Knee study (175) suggest that GPs and physiotherapists share similar concerns about the safety of exercise for CKP. However, while GPs feel more comfortable about the safety of general exercise, physiotherapists were generally more positive about local exercise (174). Thus, currently, comprehensive evidence-based management may not be provided by GPs or physiotherapists alone and dual management of (some) patients by physiotherapists and GPs may be synergistic. However, even with the uncertainties

and expertise of physiotherapists addressed, to maximise the benefit of referral to physiotherapy, GPs' perceptions of difficulties in accessing such services and of long waiting times (200) need to be addressed. Solutions may be to refine or stratify referrals, to reduce the number of referrals of patients for which physiotherapy may be unnecessary for recovery, or to substantially change the primary care model to place physiotherapists as a primary port of call.

Stratified referrals

One way of addressing perceived difficulties in access to physiotherapy may be to avoid an *ad hoc* or a blanket approach to referral (433), and to better identify the characteristics of CKP patients who are most likely to benefit from physiotherapy. This approach, which was originally developed for targeting drug treatment ('*therapeutic stratification*' (434)), has already been developed for LBP, for example, within the Subgroups for Targeted Treatment (STarTBack) study (433,435). The STarTBack tool was developed to help GPs to screen patients presenting with LBP for prognostic indicators to identify those who were most likely to benefit from early secondary prevention (435). The validated STarTBack tool was quick for patients to complete and easy for clinicians to score (433), and its use was associated with large reductions in physiotherapy referrals among patients identified as being low risk (7%) compared with those whose risk had been assessed using clinical intuition (49%) (433). When implemented in the GP setting (436), a significant reduction in physiotherapy referrals among the low risk group was not seen, but risk-appropriate referrals in the medium and high risk groups increased, patient outcomes were improved and beneficial societal effects were achieved through reduced sickness certification (436). This suggests that aligning GPs' behaviours with best-evidence

recommendations along targeted treatment pathways can be more beneficial than simply rationalising physiotherapy referrals alone (436). This work is currently being extended through the development of the STarTMusc tool, which aims to stratify care for five of the most common musculoskeletal presentations to primary care, of which CKP is one (437). Once developed and tested, methods of stratifying care could be made widely available to GPs. However, this still relies on GPs recognising the need and having the time to undertake such stratification, both of which are potential barriers to change. Alternatively, less traditional models of accessing physiotherapy may eliminate the risk of this barrier, by not requiring GPs to refer patients to physiotherapy.

Changes to the primary care model to provide physiotherapists with a more primary role

In response to the increasing workload in primary care associated with the aging population and high prevalence of complex comorbid patients, the NHS Health Education England Primary Care Workforce Commission produced a report which suggests that new models of primary care should be developed to include the variety of skills necessary to match the local population needs (438). With this in mind, substantial changes to models of primary care could place physiotherapists in a primary role in the management of patients with CKP (and other appropriate conditions) (438). This could occur through either i) direct access to a community physiotherapy service or ii) better integration of physiotherapists into GP practices (438). Direct access does not require the involvement of a GP, thus it addresses the GPs common concerns regarding time constraints, may be more efficient (439), and has been associated with reduced use of imaging and pharmacological treatment approaches (440). However, models of self-referral previously investigated have

identified some issues that would need consideration before this approach was undertaken. For example, a Dutch study identified differences in exercise provision by physiotherapists depending on whether referrals were GP- or self-initiated (441). Current evidence has not comprehensively examined the impact of self-referral to physiotherapy at an organisational and societal level, assessing the balance of cost and benefits across GPs, physiotherapists and patients' productivity (438). Potential barriers to direct access physiotherapy among patients with CKP, who are likely to be elderly with functional limitations, include lack of awareness of the service, issues relating to the geographical position of the service (which if new or difficult to reach offset the ease of access) and acceptability of the service. Indeed, direct access is often most frequently used by patients younger than 59 years and with more acute problems, however data relating specifically to CKP are lacking (442). The second option, better integration of physiotherapists into primary care practices, has a wide range of potential benefits in addition to those relating to direct access: for patients, physiotherapy would be available in a local and familiar setting, awareness of direct access may be improved (e.g. through signposting within the practice) and resolution of clinical queries affecting treatment recommendations may be more efficient (e.g. through improved communication between the GP and physiotherapist); for the physiotherapists, who could benefit from direct liaison with GPs regarding their uncertainties; and for GPs who, reciprocally, could learn from the physiotherapists and who may feel benefit from having to spend less time on CKP. Further, it is possible that the physical presence of physiotherapy services within the practice may prompt GPs to consider exercise. However, to prevent duplication of work patients would need to know that this is available and appropriate (in addition to practice-based signposting this may be aided through targeted public

health messages described in Section 7.2.4.3) and physiotherapists could be trained to prescribe common pharmacological approaches (438). It is unclear how well patients would select appropriate professionals and services and, while some patients offer the reason for their appointment request, thus enabling signposting by receptionists, patients are not always happy to relay their reason for consultation with receptionists (408). Logistically, this model may be less cost-effective within small practices (as there are fewer affected patients per practice), and the availability of physical space within practices to accommodate physiotherapists may be problematic. Thus, to implement this new model of care, feasibility testing would first be required to establish ways to inform patients about the appropriate services on offer and to prevent duplication of appointments, and federation models of working may be required (438). Such testing would need to be of adequate duration to witness typical usage of services as awareness improves (439). If physiotherapists are to become the primary initiators of exercise for CKP, strategies are required to address the deficits in their knowledge, attitudes and beliefs about exercise for CKP identified by Holden et al (175).

7.2.4.2 Placing management of CKP with alternative care providers

Given that GPs believe they have insufficient time to initiate exercise for patients with CKP, many do not find CKP an interesting clinical problem and they feel it has a low priority, another solution may be to shift the mainstay of care of this patient group to other healthcare or community service providers. Given the perceived access issues identified with physiotherapy, examples of alternative providers may include PNs, health trainers (HTs) or non-healthcare services such as local gyms. Potentially, alternative care providers may be incorporated into targeted treatment

pathways if a validated stratified care tool can be developed for CKP (see Section 7.2.4.1). Potential alternative care providers are now briefly considered.

Practice nurses

A key role of contemporary primary care PNs is to deliver care and support self-management among patients with long term conditions (LTC) (443); including conditions that are commonly comorbid with CKP. UK PNs may deliver LTC management and review through regular or extended consultation slots and, depending on the PN's expertise and the models of care employed in the practice, may see patients with acute problems. Potentially, PNs may have many roles in managing patients with CKP, those specifically related to incorporating exercise into the management plan may include: 1) initial exercise advice when patients first present, and/or 2) undertaking reviews and following-up patients to ensure they are undertaking exercise. To fit with modern healthcare needs and to maximise efficiency in the use of time, this latter role is likely to be best placed within a comprehensive health review in which all patients' morbidities are reviewed; particularly as general exercise is a shared core approach for many common conditions. Although the suggestion of routine review of patients with CKP has been contentious (394), the recommendation to review patients with CKP currently features in the NICE guidelines (2) and the newly published quality standards supports this (36). Clear allocation of one or both of these roles to PNs (or other HCPs) would eliminate the current risk of collusion of anonymity. Planned review with a PN, promotes contact in non-acute situations when patients may be more receptive to advice about exercise; this potentially addresses the perceived barrier that patients prefer other management options. This approach fits with the Kings

Fund recommendations that GPs or PNs can provide information and supported self-care (193). There is some evidence to suggest that PNs can effectively provide advice on physical activity with which patients are satisfied (444) and can be translated into increased physical activity (445). The general medical background of PNs may reduce barriers that are relevant among other more specialist professional groups, who may be less used to managing, for example, cardiovascular or metabolic disease. However, it is unclear whether PNs feel capable of undertaking this role or providing tailored exercise advice, have the time (444) or interest to do so, or whether this model of care is acceptable to patients. A recent meta-analysis examining substitution of physicians by nurses generally found a paucity of evidence and no papers specifically examined PNs managing CKP, or OA more generally, in primary care (446). There is some indication that with adequate support and training, PNs can be equipped to deliver good care for OA (443), however there is no evidence that PNs delivering this self-management support for OA results in functional improvements (447). Training nurses to deliver such care also carries with it the familiar barriers of time and cost. Given that PNs work closely with GPs, and often seek advice from them during times of uncertainty, the need to address the uncertainties, knowledge gaps and skills among GPs thus remains pertinent.

Health trainers

The Department of Health recommended the introduction of accredited HTs to support patients who are at risk of harm from their lifestyle to make positive changes (448). There is heterogeneity in the skills and roles of HTs as they are not required to be medically trained and local primary care organisations could deliver HT services in whatever way they felt would best suit their local health needs. Generally,

HTs advise, support and signpost patients regarding their lifestyle and support behaviour change through goal setting (448). The usual focus is on issues such as diet, physical activity, smoking and mental wellbeing. These professionals were not well utilised by GPs in the main survey, possibly due to lack of availability or perceived lack of relevance to the context of CKP. However, some HTs already provide advice and support to patients with CKP (449), and where they are not, they provide general exercise advice and they are thus familiar with goal setting and individualising advice which assists patients to increase their physical activity. Therefore, it is possible that the HT role can be broadened more generally across the UK, either by upskilling HTs to advise patients on tailored local exercises or to ensure that HTs are well equipped to signpost patient with CKP to appropriate services that can provide this support.

Staff within local gyms

An alternative, or perhaps complementary, strategy to HCPs initiating and supporting patients to exercises is for local councils or businesses to provide these services. Possibly in collaboration with CCGs, these community providers may develop facilities for safe, supported and appropriate exercise programmes for patients with CKP, and other musculoskeletal conditions. This has been identified as an acceptable strategy for some patients (450), particularly as it can be incorporated within their normal life rather than being seen as medical treatment (403). The links between communities, councils, housing, community developments and healthcare that may facilitate this type of approach are already being forged, for example through public health guidelines relating to physical activity (451). Such an approach, which places strategies to support patients to improve their health within

their local communities and normal lifestyle, may be more likely to improve adherence, particularly if they are near to patients' homes or have flexible opening times, which would best enable patients to fit such strategies alongside their other commitments and priorities (79). Use of gyms was not frequently mentioned by GPs responding to the main survey and a Dutch survey of GPs which investigated exercise initiation among their general patient population may help to explain why; 46% of GPs acknowledged the financial restraints of using the gym and 20% had insufficient knowledge of the local exercise facilities (403). However, again, the high prevalence of comorbidities, multiple joint pains and being overweight or obese (93) among patients with CKP may present a problem. It is unclear whether exercise instructors or staff in local gyms have confidence in managing patients with musculoskeletal pain. Commonly, people attending gyms are requested to provide a GP note to confirm they are '*fit*' to exercise in that gym. This may present a barrier to patients undertaking timely exercise, particularly given the uncertainties of GPs regarding the safety of exercise and the potential for GPs to be uncertain about what they are being asked to declare the patient '*fit*' for. One solution may be to have closer working between local gyms and appropriately trained HCPs (e.g. GPs or physiotherapists) but, once again, this requires the HCPs to have their uncertainties, knowledge gaps and skills regarding exercise for CKP addressed.

7.2.4.3 Targeted public health messages and campaigns

Given that among people with knee pain who have severe pain or disability, half have not seen their GP about this in the previous year and a tenth have not seen their GP or undertaken any self-management strategies (100), there may be scope to improve pain and functioning in the community through the effective

dissemination and delivery of targeted public health messages and campaigns. Because the management for CKP is common to OA in other areas the reach of such campaigns would be wider than those with CKP alone. Targeted campaigns could raise awareness of the core management approaches for OA in general, including pragmatic ways to undertake the recommended types of exercise without the need to rely on formal health or exercise services, practical strategies to manage their pain without the use of medication, the risks of pharmacological approaches in contrast to non-pharmacological strategies and where and how to seek appropriate services. If informed by existing empirical evidence about patients' concerns and uncertainties (19,79,84,87,89,95-108), campaigns could specifically address known barriers to exercise. Public health campaigns and targeted messaging can take a variety of forms, and can have variable success (452). A good example of a national public health campaign is the change4life campaign that was launched in 2009 and was initially aimed at parents of children with a view to tackling obesity (453). Through television, print and poster advertising, targeted mailing of information, a helpline and website and active engagement of local and national groups, schools, organisations and businesses (454,455), change4life now promotes pragmatic healthy living support for all (456). While there is some evidence change4life has been effective in prompting change (454,457), this has required huge resource and has taken years to develop and refine (458). Not all such strategies are equally effective for all people. While television campaigns (459) and targeted mailings (455) can be effective in raising awareness, translation of awareness into attitude and/or behaviour change can be low, particularly among older adults (459). While the potential of a public health approach to manage CKP and associated prevalent musculoskeletal pain is recognised (460), a national UK approach to raise

awareness of self-management and lifestyle changes to manage CKP among those not actively seeking information does not exist. Given the commonalities in core lifestyle approaches between musculoskeletal problems and the cardiovascular, respiratory and metabolic problems which commonly coexist (75), the drive to deliver holistic behavioural change strategies rather than single disease focused approaches is entirely appropriate (457). While public health messages and campaigns should be considered to promote self-management and exercise among patients with CKP, such strategies should be carefully evaluated, to ensure best use of the inevitably large resource that would be required. It is unlikely that such campaigns would provide sufficiently tailored advice to support all patients to undertake the exercise they need to meet evidence-based recommendations, however, they could raise awareness and signpost patients to local services capable of providing tailored support (461).

7.2.4.4 New management approaches to improve adherence

From the sections above, it becomes increasingly apparent that GPs are likely to continue to have at least some role in, and thus require expertise in, identifying the need for and promoting (tailored) exercise among patients with CKP. However, given that ongoing adherence to exercise is a widely acknowledged problem, time limitations are prominent among GPs and there was less consensus about the need for and the role of GPs in following-up patients than there was about their role in the initial delivery of exercise advice, it may be necessary to consider alternative ways of supporting patient exercise adherence that have a low burden on GPs. Although this role could be adopted by PNs or HTs (see Section 7.2.4.2), alternative

strategies such as motivational interventions or technology to promote exercise adherence are possible alternatives.

Supporting adherence to exercise through motivational interventions

Motivational interventions are founded in the assumptions that motivation is a prerequisite for patient behaviour change, that it is dynamic and can be modified (462). Prochaska and Diclemente's transtheoretical stages-of-change model, describes the stages of behaviour change (precontemplation, contemplation, preparation (determination or intention), change (action) and maintenance) (462-464). Motivational interventions were traditionally designed to move patients through these stages while acknowledging that progression may not be unidirectional (i.e. patients can move back (recurrence) and forth) (462). Motivational interventions may take many forms, from simple advice and brief interventions, through to multiple sessions of counselling (462), delivered individually or to groups (465). Motivational interviewing (MI) is a particular type of motivational intervention that uses communication approaches to help patients to change their behaviour (462). MI is delivered using discussion, open questions, and highlighting discrepancies between patients' current situation and their desired one, rather than simply instructing patients (462,466). To promote exercise adherence among patients with CKP it is likely that multiple sessions will be required over time, to help patients to address any barriers they encounter, to assist them to incorporate exercise within their daily life and return patients to an action stage if they have fallen out of it.

Medical training is not a pre-requisite to deliver motivational interventions (466), therefore this could be undertaken by PNs, HTs or physiotherapists. A meta-

analysis that examined the use of motivational interventions in conjunction with physiotherapy found patients increased their physical activity and subsequent adherence (81). However, included studies used heterogeneous approaches for a variety of musculoskeletal and non-musculoskeletal conditions so are not directly transferable to the context of CKP (81). Further, two studies examining PNs' use of MI to discuss lifestyle changes in general (467,468) and with patients with diabetes (469), have demonstrated suboptimal application of MI by these HCPs (467-469) and inadequate individualisation of lifestyle counselling (467). Thus for PNs to provide effective MI to patients with CKP to promote them to undertake and adhere to exercise, high levels of training, feedback and supervision over the long-term may be required (468).

While motivational interventions continue to have the potential to be a valuable strategy to improve health behaviours, the traditional approaches based on the transtheoretical stages-of-change model have received some criticism, particularly in relation to promoting increased physical activity (470,471). Reviews of interventions based on this model have not produced evidence that such interventions are effective in promoting long-term increased physical activity (470). Postulated reasons for the lack of efficacy of such interventions include the recognition that the transtheoretical model is too simplistic for a complex behaviour such as exercise which has multiple influencing factors, not just the individual's motivation alone (470). It is now recognised that an individuals' motivation to undertake exercise behaviour arises from an appraisal of the benefits and the burdens associated with the required behaviour (471,472). Two theoretical models which have been examined in relation to motivations to undertake exercise are the Health Belief Model (HBM) and Protection Motivation Theory (PMT). HBM

acknowledges that behaviour is influenced by one's beliefs about their susceptibility to, and severity of, negative outcomes arising from the condition they are trying to prevent/manage, balanced with their assessment of the benefits of, and barriers to, the necessary behaviour (473). Similarly, PMT suggests that environmental factors (verbal persuasion, observational learning) and intrapersonal variables (personality and feedback from previous experience) feed into an appraisal of the perceived threats and ability to '*cope*' (472). This process balances beliefs about severity of, and vulnerability to, negative outcomes, rewards for not undertaking optimal behaviours, beliefs regarding the effectiveness of the behaviour and self-efficacy to undertake the behaviour, and the response costs (e.g. burden associated with making the change) (472). While these theories do not reliably predict behaviour as, for example, some people may recognise the severity of their condition but still not undertake the required behaviour (474), the appreciation of this complexity, and the fact that such appraisals can be dynamic over time, helps to demonstrate why specific, and slightly more complex, motivational interventions may be required to promote initiation and ongoing use of exercise, rather than simply relying on provision of advice alone. To inform behaviour change interventions, theories have been developed which recognise the complexity of influences on motivation with the incorporation of sociocognitive approaches such as self-efficacy (475). One such theory is self–determination theory (SDT) which recognises that behaviour can arise from different intrinsic and extrinsic motivators (each with different levels of influence (476)), that individuals are more likely to be motivated to undertake behaviours such as exercise if it satisfies three '*innate psychological needs*' (perceived competence that the outcome can be achieved, relatedness to others (i.e. being understood by or feeling close to others) and autonomy) (476,477) and that the social context is

also influencial (476). SDT has been used to underpin behaviour change interventions (478,479) and there is now support for contemporary health-related motivational interventions to encompass SDT, that is providing psychological need support and autonomous self-regulation and acknowledging the influence of external motivators (476).

Requiring GPs to identify the need for exercise, discuss and '*sell'* this management strategy to the patient and make the referral for a motivational and/or behaviour change intervention is feasible in the limited consultation time available. Such advice has the potential to endorse the target behaviour, thus potentially making the individual's appraisal of the benefits versus the burdens more positive. However, the optimum method for delivering effective motivational interventions among patients with CKP to promote them to undertake and adhere to exercise programmes is not yet clear (81). The commissioning of adequate, timely, appropriate and local services would be necessary for such interventions to be a feasible option.

Supporting adherence to exercise using technology

Technology may promote adherence to exercise. Technology may take a variety of forms for numerous purposes; for example, websites (e.g. education, motivational support and goal setting (480,481)), smartphone applications (e.g. activity tracking, education) and approaches through which HCPs and patients can interact (482) such as telehealth (e.g. education, monitoring, prompting of necessary action (483)). Telehealth itself has many formats, ranging from simple telehealth, which utilises text messages sent to and from a patient's mobile phone (484), through to use of video calling and/or complex telehealth hubs which automatically transmit a range

of clinical data to central servers (483). Technologies can be combined and tailored to the individual patient's needs and preferences (e.g. educational websites can be programmed to deliver text-messages to patients (481)) and can support the management of multiple conditions within the same patient. In addition to improved adherence, the theoretical benefits of using technology may include; more convenient access to care, enhanced education, demonstrating through feedback improvements in symptoms or function, reinforcement of motivational strategies and possibly lower cost for more frequent contacts.

Use of telehealth for musculoskeletal problems is still in its infancy, however in addition to monitoring adherence (with or without the use of equipment such as pedometers or accelerometers (485) or global positioning system (GPS) enabled tracking devices) this technology has the potential to monitor pain, prompt patients to undertake exercise (or take analgesia) and/or to support education (486). Some evidence suggests that web-based interventions may improve physical activity levels across a variety of patient groups (487) and that this type of intervention may be acceptable in patients with CKP (488). However, the acceptability and feasibility of using other types of technology is uncertain and evidence supporting outcomes and the most appropriate model within which to deliver this care for CKP is unknown. The theoretical technology acceptance model (TAM) (489,490) considers three contexts impacting on a HCP's intention to use a specific technology; i) technological context (includes perceived ease of use (which is influenced by habit) and perceived usefulness), ii) individual context (compatibility of the technology with the individual's existing values and attitude), and iii) organisational context (facilitators and subjective norm) (489). As the underpinning theoretical model and the TAM have shared origins, future research examining the use of technology in

supporting adherence to exercise among patients with CKP could be informed by a model in which elements of the TAM are mapped onto the underpinning theoretical model outlined in this thesis.

7.2.5 Supporting better implementation of evidence-based recommendations in practice: educational approaches, organisational changes and behaviour change strategies

GPs are well placed to initiate exercise as they often have a holistic understanding of their patients, their medical conditions and wider psychosocial issues. Promotion of physical activity in primary care can result in positive change in general primary care patient populations (68,426,491). Among patients with self-reported arthritis, those who have been advised by a HCP that exercise would benefit their condition have been found to be more likely to report exercising than those who had not received this advice (429,492). Although few studies investigating primary care exercise interventions have been delivered by GPs, this previous work suggests the potential for improved patient outcomes through optimised exercise delivery and support by primary care teams (68,426,491). Further, as the primary point of reference for advice for other professionals involved in the care of their patients, GPs need to be up-to-date with evidence-based recommendations regardless of who the primary service provider for patients with CKP is in the future. A Kings Fund report suggested that an improved awareness of arthritis may promote '*GP's willingness to accept patients' musculoskeletal complaints as more than "just aches and pains" and their readiness to help*' (193). Indeed, familiarity and knowledge of the guidelines was associated with increased use of exercise among respondents to the main survey. Such an effect on evidence-based behaviour has previously been noted elsewhere, for example, in the management of a patient with diabetic

complications (321). However, there are significant barriers to supporting GPs to be familiar with evidence-based guidelines (493). For example, in April 2015 there were 229 published NICE guidelines (494), many of which were relevant to GPs. Time limitations prohibit most GPs from being able to read all relevant available guidance; anecdotal evidence suggests many physicians spend less than one hour reading a week (215). Therefore, effective and acceptable educational approaches, behaviour change strategies and organisational changes need to be considered to identify a way to help GPs to be aware of, and then go on to routinely deliver, evidence-based care. The solution to improving delivery of evidence-based care is not straightforward and is likely to involve a combination of approaches; potential approaches are now considered.

7.2.5.1 Educational approaches

Simple educational approaches

Simple educational strategies to disseminate evidence-based recommendations and promote behaviours in line with these may include printed educational materials (e.g. printed journals) (495), online learning modules (416), educational games (496) or information portals (497), workshops or educational meetings. Given that a significant proportion of GPs have not been given any education or training in how to prescribe or advise exercise more generally (389), let alone for patients with CKP, this appears to be a logical approach. However, empirical work investigating simple educational interventions have had mixed results and often at best only result in only small changes in GPs' clinical attitudes, beliefs and behaviours (495,496,498). For example, a short (45-60 minute), single training session on current management guidelines did not result in clinical benefit for patients with lower limb OA (499),

however longer workshops (four hours to two days in duration) were found to increase GPs' exercise use among patients with arthritis (500) and/or changes in self-reported attitudes, beliefs and clinical behaviours about LBP (501) and to improve pain and functioning in patients with OA (502).

A lack of interest may be a reason for a limited impact from simple educational strategies Indeed, GPs who have not received training in prescribing or advising exercise do not necessarily wish to address this (389). Given the reported low interest and prioritisation of CKP and perceptions of significant time pressures among GPs, lack of engagement may be a particular problem in the context of this PhD. However, a more fundamental and general explanation for simple educational strategies failing to consistently change behaviours may lie in the way individuals cognitively process routine, familiar situations. Schema theory suggests that knowledge is stored in representations of what we understand (rather than a collection of single concepts) to minimise future cognitive processes when faced with similar situations (421). While the situation aligns to preformed schema, automatic responses ('*scripts*') are elicited (421). Ill-fitting, new information requires either reorganisation of the relevant schema (cognitively-demanding) or interpretation of new information in such a way that it fits their existing schema (less cognitively demanding but also potentially inaccurate or less comprehensive understanding) (503). Thus, unless the content of a single brief educational approach is closely aligned with one's existing schema this may be an inadequate trigger for an individual to modify their schema and change their behaviour. Responses to the main survey such as '*I know this is no longer advised explanation*

but I can't stop myself -> wear and tear' (see Appendix 27), may be an example of this.

To overcome lack of interest, single, extensive educational programmes could be devised that cover key guidelines across the scope of general practice could be developed and made compulsory for revalidation purposes. However, time pressures mean that this is likely to be difficult to achieve. Accepting this and that CKP is not perceived to be a priority clinical problem for the majority of GPs, planned learning about CKP may not be realistic. Thus, a final simple educational approach may be to make available brief guideline summaries that supply appropriate information if and when GPs identify a need for this. This would negate the issue of lack of interest and will inform GPs who have chosen to learn and thus be more likely to see the value in making the effort to internalise new information. Current guideline summaries are published in numerous places and information within them can be too comprehensive, commercially funded, password protected and dubiously maintained. The value of accurate summaries would be maximised if they: specifically target GPs (504), provide links to related evidence, patient information leaflets or learning modules, are housed in a single trusted portal accessed through electronic medical records and are highlighted by brief email alerts or printed summaries in primary care publications. This could be further improved by integrating details of available local healthcare and non-healthcare services that may support their patients to meet evidence-based recommendations (e.g. staff at local gyms, HTs, exercise programmes). The new Map of Medicine format goes some way to delivering on many of these goals (414). As this service is rolled out (which is currently underway) it may prove to be the platform upon which these recommendations can be delivered.

Complex educational approaches

Recognising that management of patients with CKP is complex and delivered by multiple HCPs, complex educational approaches have been developed and tested in primary care to support patient self-management. While it can be argued that these are organisational changes (see Section 7.2.5.2) some complex interventions are primarily based on education. For example, the Dutch stepped-care strategy 'Beating osteoARThritis' (BART) (505) was designed to improve GPs' non-surgical management of patients presenting for the first time with lower limb OA by explicitly highlighting recommended diagnostic procedures, management approaches and length to follow-up (264,505). GP education consisted of outreach visits, printed educational and reminder materials and the opportunity to attend a multidisciplinary seminar about OA; patients also received a self-management support booklet (505). While the study identified improvements in patients' pain and functioning overall, significant differences were not observed when these outcomes were compared among patients who received management that was consistent with the stepped-care strategy and those who did not (505). Another example of a complex trial with a significant educational approach is the Management of Osteoarthritis in Consultations (MOSAICS) study cluster trial, which was designed to improve supported self-management of OA (506). Multiple educational GP and PN training sessions focused on the clinical management of OA and delivery of care through model consultations supported by a supplementary guidebook (506). Model OA consultations were defined as those in which the GP gave the diagnosis (after eliciting the patients' ideas, concerns expectations, and used the word osteoarthritis), explained the diagnosis (using the word osteoarthritis, explains that progression is not inevitable and it is treatable), addressed expectations and

responded to those of the patient, provided analgesia (identifies strategies already tried and advises/prescribes pain relief), promoted self-management (after identifying what has already been tried, advises exercise and weight loss) and promoted self-management support (using written information and follow up appointment) (507). Results of this intervention are awaited and will help to determine the value of this type of approach. However, time, financial resource and competing priorities are clear challenges for this type of intervention and may inhibit wider success, particularly among less interested GP practices that may not recognise the value in involvement (508). For example, 157 GPs in 70 practices were eligible to participate in the BART study, however only half (70 GPs in 38 practices) participated (505) and only six GP participants attended the educational seminar (264). Further work to identify the value of and optimum way of delivering complex or ongoing educational interventions is required.

7.2.5.2 Organisational changes

When trying to elicit behavioural change, educational strategies may take time, may require regular contacts, risk lack of engagement and thus can have limited effects. Therefore, organisational change may be an alternative, and perhaps more rapid way, of eliciting behaviour change. Some organisational change ideas have already been discussed, such as changing the HCP who takes primary responsibility for initiating exercise and/or following-up patients with CKP and complex educational approaches (which were often a combination of educational and organisational change strategies). While promotion (through audit) and/or incentivisation of high quality evidence-base care may be classified as organisational change, these will be discussed in Section 7.2.5.3. Organisational changes do not solely relate to the

clinical environment but also to the training of GPs. One approach to improve the management of CKP and avoid GPs having to unlearn ingrained approaches, is to ensure that GP training curricula promote adequate focus on low priority conditions. This is discussed below after first considering the potential impact of inserting templates into electronic medical records to prompt GPs to consider recommended management approaches for CKP.

Implementation of templates into electronic medical records

Electronic patient records used in primary care are becoming increasingly '*intelligent*' and can be programmed to automatically suggest relevant Read Codes and templates according to data entered. The integration of clinical coding templates is a strategy that can improve recording of care (which, in the context of exercise for CKP, is particularly poorly documented in medical records (236)), but may also serve to prompt GPs to consider the included management strategies (509). Once uploaded into the electronic medical record software, unless there are changes to the recommendations, templates require no ongoing external action. They are therefore a relatively cheap and sustainable way of promoting quick, standardised recording of activities, provided that the GP engages with them. Empirical evidence suggests that point-of-care, on-screen computer reminders can influence HCPs' processes of care and patient outcomes, however, absolute improvements may be small (498,510-512). A study nested within the MOSAICS study, described above, examined the effect of an electronic template, containing primary care management quality indicators, on the quality of care delivered during OA consultations (509). Introduction of the template was supported by an educational outreach session and the template was triggered whenever HCPs entered an OA Read code into a

patient's records (509). Before and after analysis of clinical behaviours suggested that the template improved recorded attainment of quality indicators, in particular for weight recording and alignment of pharmacological therapy to best evidence recommendations (509). However, the least frequently achieved quality indicator was consideration of physiotherapy referral and recording of use of exercise advice was only 50% after template introduction thus it is possible that exercise use may only be improved by using integrated templates alongside more complex interventions (509,513). Given that the practices in which this template was studied were likely to be more interested than average and that more than a quarter of patients with an OA code did not have a template entry (509), further work is required to identify how primary care clinicians use electronic templates and how they can thus be implemented to best influence exercise use among patients with CKP.

Changing the focus of GP training

Given that relevant postgraduate training was only recalled by 39% of GPs responding to the main survey, the need for wider professional education is indicated. However, as discussed, issues including perceiving the need and having the interest and time to undertake such education may be barriers. Therefore, a more top-down, organisational level approach may be required, this may be through changing GP training.

Current GP training in the UK is based upon a curriculum which details 26 statements, only two of which are related to CKP; i) care of people with musculoskeletal problems and ii) promoting health and preventing disease (514). Although competences across the range of statements must be demonstrated, the

focus of portfolio entries and assessments is dictated by the trainee, their supervisors and the patient cases encountered. The lack of interest and priority that GPs hold for CKP, as evidenced by the current research and a previous Kings Fund report (193), may prevent such cases from being selected for consideration of learning encounters and assessments. Therefore, in order to promote consideration of conditions perceived to be less interesting, but which present frequently to primary care, it may be necessary to set specific mandatory objectives and/or to develop assessments that require trainees to specifically demonstrate competence in providing individualised exercise advice in addition to other core health promotion activities (e.g. increasing physical activity). Such an approach may have the potential for wider benefit than for CKP patients alone, as general exercise is recognised as a primary modifiable risk factor for multiple common chronic diseases and is generally underused by doctors for many conditions for which it is a core management approach (515).

7.2.5.3 Behaviour change strategies

There is some fluidity in the categorisation of educational, organisational and behaviour change strategies; many approaches discussed in this chapter may fit within more than one of these categories. This continues to be the case for performance feedback and incentivisation, both may be considered educational (if they help to disseminate and raise awareness of guideline recommendations) and organisational change strategies. However, they are now considered in the context of their application being primarily used to prompt behaviour change.

Performance feedback

Quality standards to support the NICE OA guidelines have recently been developed (36). Such quality standards could support centrally (e.g. CCG) orchestrated performance feedback which, if implemented without punitive outcomes in mind, may promote improved alignment with evidence-based recommendations. For example, CCGs could audit routinely collected data against published quality standards and provide feedback, goals and action plans to practices. They could provide information that outlines how each practice is doing in absolute and comparative terms. This process is familiar to GPs who are expected to undertake audit (514), are already subject to CCG-led audits (e.g. of prescribing practices) and it would have the inherent benefits of disseminating and highlighting quality standards to GP practices, underlining the expected role of primary care teams and providing the platform to promote individual reflection and quality improvement. These activities may provide additional motivation as they could be used for GPs' personal revalidation. There is evidence that audit and feedback can narrow the evidence-practice gap (215,516), and feedback may improve confidence in one's competence, strengthen intrinsic motivation and autonomy and may subsequently '*promote behavioural changes as well as a positive attitude towards the use of the guidelines*' (191). However, the value of feedback in this context is reliant on the underlying quality standards being adequately weighted to reflect the core management approaches. Although some quality standards appear to have a disproportionate focus on non-exercise interventions or recommendations (193), recently published standards are more balanced and could alternatively be adopted (36,517); including the very recently NICE quality standards for OA which dedicates a whole quality standard to the provision of exercise advice (36). Given the

significant barriers of GP time, competing demands and limitations on resources to deliver and take part in educational interventions for CKP, in addition to the plethora of conditions GPs have to manage, this may represent a feasible way to deliver brief education on a wide scale and meets the expectations of CCGs recommended by Arthritis Research UK in ensuring that OA guidelines are implemented in practice (32). While a review of the effectiveness of audit and feedback suggested that its impact on professional practice and patient outcomes is maximal if undertaken by GPs and their colleagues (516) (i.e. rather than CCGs), this needs to be balanced with the high risk of lack of engagement if GPs are expected to undertake the audit and the benefit obtained from providing feedback (which can be calibrated against the results of other local practices), targets and action plans (516). Finally, suboptimal quality of Read Coding in electronic medical records may present a barrier to effective and accurate audit. However, given the potential for integrated templates to improve quality of care when used alone (see Section 7.2.5.2), if used alongside centrally orchestrated audit and feedback, evidence suggests there may be even greater benefits to quality of care and thus, potentially, patient outcomes (516,518).

Incentivisation of high quality evidence-based care

High quality evidence-based care can be promoted and supported through incentivisation (or pay-for-performance) schemes, which can be effective in changing doctors' behaviour (519). Familiar to UK GPs is the voluntary QOF, which was introduced in 2004 to encourage a population health approach (520). The QOF outlines domains comprising of specific indicators with attributed attainment targets. Attainment of targets translates to points which, in turn, are converted to financial

reward. When included indicators have a robust evidence base, theoretical benefits of this approach include explicit communication of expected roles/actions/responsibilities of primary care teams, provision of standardised care across the whole population, dissemination of key evidence-based recommendations via the indicators and additional motivation for GPs to undertake the behaviour. Thus, it is possible that inclusion in an incentivised scheme may be an effective strategy to improve the use of exercise for CKP among primary care teams. Given that NICE now hosts QOF (521) and that they have developed and published OA guidelines and quality standards, development of OA QOF standards seems logical and straightforward, particularly as it is such a common condition.

While there is increasing use of incentivisation schemes for GPs, evidence for their effectiveness is inconsistent and a recent Cochrane review (522) concluded that they could neither be supported nor rejected as an effective means to improving quality of primary care. While some studies show improvement in process measures (522-525), outcome measures (526) and some reductions in health inequalities (523), this is not necessarily associated with improved patient outcomes (522). Even in the acknowledgement of benefits, some argue that improvements brought about by incentivisation schemes are not cost effective and that some may have occurred despite the scheme rather than because of it (523). Further, incentivisation schemes can have unintended consequences, for example; GPs do not necessarily take a population approach to standardising care, rather they often get drawn towards higher risk cases (520), there can be disproportioned time and/or resource used to chase targets (when compared to the resulting patient benefit or financial reimbursement) (520) and important non-incentivised care processes can be neglected (523). Further, unless carefully worded, incentivisation schemes can

encourage that activities are undertaken (for example that exercise advice is given) but may not inevitably result in this activities being undertaken to high quality (e.g. the alignment of exercise advice with evidence-based recommendations).

Considering the evidence, while incentivisation of high quality care does not inevitably result in improved care across the entire patient population, it may well be a tool that could be used to improve GPs' awareness of the core role of exercise in the management of patients with CKP (or OA, more broadly) and could help to promote delivery of exercise advice in line with evidence-based recommendations, for example through clarity of focus to managing target conditions thus prompting development of dedicated follow-up clinics (520). Consideration of OA as a QOF domain is not novel, however, in one cross-sectional survey most responding GPs believed that OA should not be added as a QOF domain (330). Reasons for this included GPs normalisation of OA and dissatisfaction with their existing workload (330). However, of those GPs who thought OA should have its own QOF domain, 80% believed that exercise advice should be an included indicator (330). Given the predominantly negative opinion about the proposal for OA to be a QOF domain, if incentivisation of OA care is to be undertaken, the following steps may help to maximise its likely benefit: improve recording of care through the use of an integrated template (see Section 7.2.5.2), use of carefully worded indicators that promote alignment with evidence-based recommendations, associated organisational changes to ensure that indicators can be achieved in meaningful and sustainable way and to make sources of exercise support and follow-up easily accessible (e.g. upskilling PNs) (527). Finally any new indicators should be investigated for their value (e.g. patient outcomes and cost-effectiveness) and unintended consequences (528).

7.3 Recommendations for future research

7.3.1 Research to test the suggested interventions resulting from this work

In the current UK NHS service model it seems likely that GPs will continue to be expected to have a significant role in initiating exercise for patients with CKP, however, there may be scope to shift the primary responsibility for following-up and reviewing patients to alternative providers (see Section 7.2.4). Further research is required to identify the optimum way to support GPs to meet expectations to initiate exercise, for example to: develop a consensus on the roles of GPs (and other HCPs) in the initiation and follow-up of exercise for CKP; devise an acceptable and usable description of CKP that promotes exercise as a useful strategy; and identify the optimum approach to support patients presenting to primary care to use local and general exercises to manage their CKP. Such research will need to consider the optimum tools (e.g. written management plans), professional groups and technologies to use to deliver exercise and promote adherence within the management of patients with CKP. It is likely that the solution to address the evidence-practice gaps will be a combination of educational, behaviour change and organisational change strategies (529). However, combining multiple interventions does not necessarily increase the chance of benefit of using a single intervention (530). Thus to identify the interventions that are most likely to result in improved delivery of evidence-base care, an understanding of the key factors that dictate GPs' behaviours is necessary. This research goes some way to identify factors associated with GPs' use of exercise and supports the theoretical associations proposed between use of exercise and beliefs about role and moral norms, beliefs about consequences and GP-related factors pertaining to beliefs about capabilities.

However, some results challenged the links within the underpinning theoretical model (described in Chapter 2) and, some elements of the underpinning model were inadequately tested and examined, for example the impact of patient factors on social influences and the effect of habit and past behaviour. Thus, further work is needed to better understand the exercise behaviours of GPs. This is now discussed further before briefly considering the implications of the low response identified in the pilot and main surveys.

7.3.2 Further research on GP behaviour regarding exercise for CKP

Investigation of GPs' use of exercise for CKP was informed by an underpinning model (see Chapter 2) drawing on several appropriate theories of behaviour. The adapted PABS_PT and attitude statements relating to evidence-based recommendations about exercise were utilised to assess GPs' attitudes and beliefs about CKP and the use of exercise in this context. Although the underpinning model demonstrated some value in predicting and explaining GPs' behaviour (particularly GPs beliefs about their role and moral norm, beliefs about consequences and GP-related factors pertaining to beliefs about capabilities), other elements of the model did not predict behaviour in the expected ways. Suggestions for revisions to the underpinning model are now presented before addressing the problems identified with the adapted PABS_PT tool used to assess GPs attitudes about CKP.

7.3.2.1 Refining the underpinning theoretical model

Predicting GPs behaviour is recognised to be difficult; for example, Bedson et al (123) found no pattern to the decisions to x-ray patients when GPs were presented with a series of case vignettes. While Lipworth et al highlight that clinical behaviours

can be impacted by the presence of only one barrier arising from the TDF (152), GPs' exercise behaviour for CKP appears to be insufficiently explained by the underpinning model summarised in Chapter 2. In retrospect, elements of the underpinning model were given inadequate focus within the main survey questionnaire. For example, patient influence appeared to play a part in dictating what GPs did (e.g. use of non-evidence-based management approaches (see Section 6.3.6.1)). While patient influence was acknowledged in the revised investigation item in the main survey (i.e., through the inclusion of the option '*to reassure the patient*' as a reason for undertaking each investigation), there was insufficient direct questioning on this to adequately assess the association between patient social norms on GP behaviours. Further, while examining habit and past behaviours may require methods such as medical record review, there may have been scope to ask GPs about their use of set phrases or management strategies (as opposed to individualised), which links schema theory (regarding storage of knowledge, discussed in Section 7.2.5.1) with habit and past behaviour. The original model placed inadequate emphasis on the impact of perceptions of time limitations. Although this was positioned within environmental context and resources (the TDF domain placed in the beliefs about capabilities element of the underpinning model), the impact of time perceptions on the nature of behaviour was assessed using limited *a posteriori* analyses. This revealed that perceptions of time limitations were not associated with the use of exercise, but the way that local exercises were initiated. The lack of focus on certain elements of the underpinning model does not completely explain the lack of understanding of the behaviours and associations of behaviours with identified attitudes and beliefs arising from the main survey. Following the development of the underpinning theoretical model and the design of

the questionnaire survey, an updated version of the TDF was published (531). The changes to the TDF were therefore not incorporated into the original underpinning model described in Chapter 2 and thus were not considered during development of the survey tools. Changes to the TDF were that 'nature of behaviours' was removed and 'optimism', 'intentions' and 'reinforcement' were added (531). Retrospectively considering the results of the survey in light of these changes to the TDF, does not help to further explain the results from the main survey. This suggests that future enquiries about GP exercise behaviour may need to adopt different strategies and the underpinning model may need further refinement.

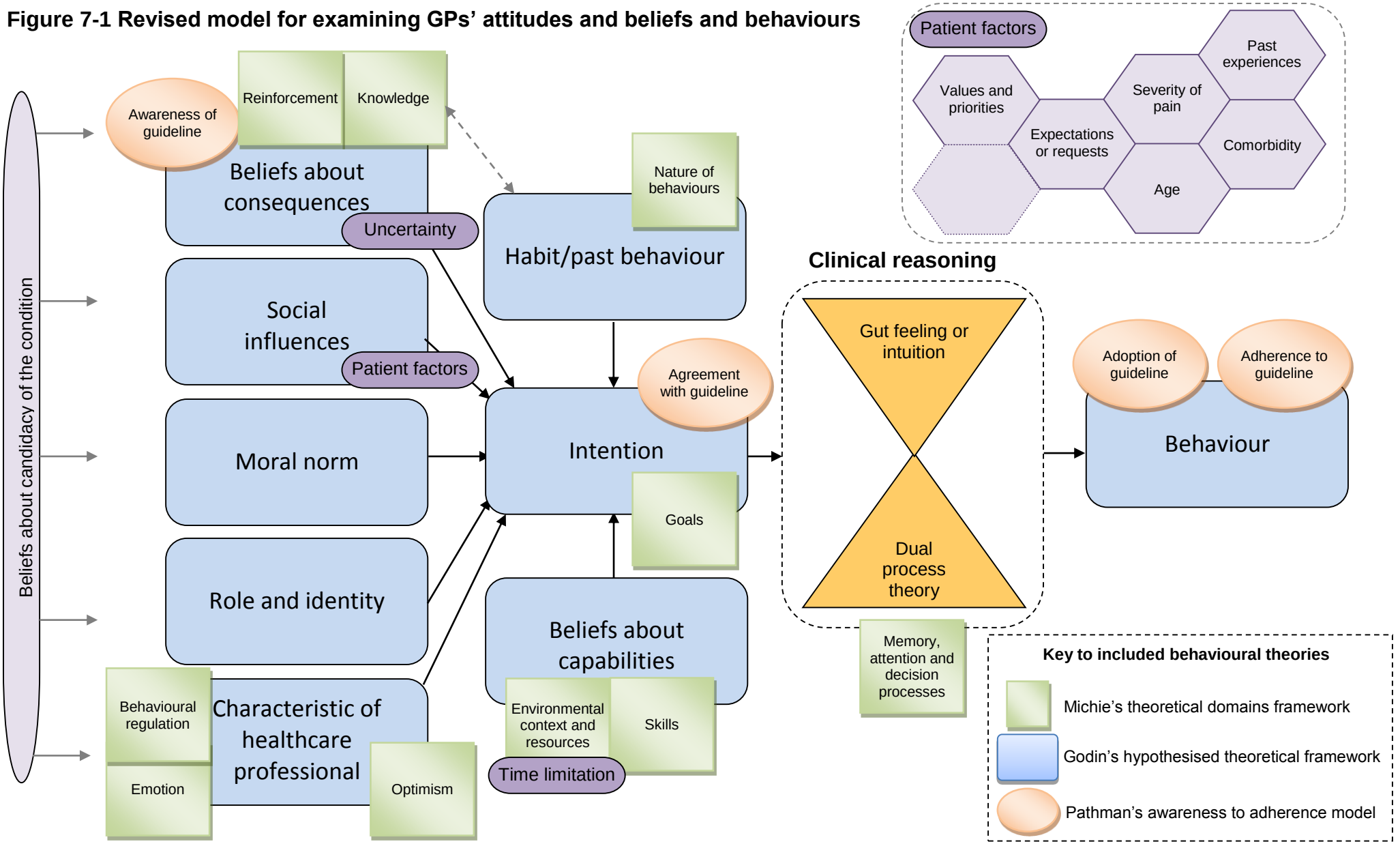
Sociocognitive theories seem to less robustly predict physicians' behaviours compared with those of other HCPs (131). Given that the underpinning model was developed from sociocognitive theories alone, it may be that shifting the focus of investigation to include clinical reasoning (532), specifically in the context of decision-making theory, may help to better understand why attitudes and beliefs of GPs do not necessarily explain their behaviours. How GPs make decisions has been long considered (533) but no clear understanding has been reached (532) despite the development of several theories. One such theory is the dual process theory (DPT) which has been examined in the context of medical decision-making in general and among GPs (532). DPT describes two types of decision-making, the first (system 1) is a fast, intuitive approach during which clinicians act automatically, the second (system 2) is a slow, conscious, analytical approach (191,532,534). Employment of each system depends upon the time available, the type, potential severity or complexity of the problem, extent and context of uncertainty and the experience of the decision-maker (191,532). When faced with a complex situation an analytical, system 2 approach may be triggered. However this approach is too

cognitively-demanding and time-intensive to be used for all decisions (532). Conversely problems that clinicians perceive to be routine, or for which there is little uncertainty, if time pressures exist or there is a lack of confidence, system 1 decision-making may be favoured (532) at the expense of inaccuracy (191). This rapid decision may not take into account the exact nature, needs, priorities and nuances of the particular patient consulting with the GP and can lead to diagnostic errors or suboptimal management plans. Previous work has described GPs as acting on '*gut feelings*' in the face of time pressure and uncertainty (535), which is likely to be synonymous to the DPT the phenomenon of using the least cognitively demanding approach (i.e. '*cognitive miser*') (191). Indeed, human nature is to favour system 1 due to it being less cognitively-demanding. Refocussing investigations of GPs' behaviours to include this approach seems logical given that the low level of interest and priority identified among GPs regarding CKP and the pervasive perception of time limitations identified in the main survey may bias decision-making towards a system 1 approach. Examination of decision-making may make sense of seemingly illogical associations with exercise use (e.g. similar use of exercise among those who agreed (90%) and disagreed (88%) that local exercise is safe (see Table 6-20)), through considering influences that predominate in intuitive decisions. Although the original version of the TDF (133) did contain a memory, attention and decision-making processes domain, this was placed within the characteristics of healthcare professional element of the underpinning model. This placement resulted in insufficient focus on this as a potentially key influence that decision-making may have to play in the behaviours of GPs in a time-pressured environment and implied that decision-making is static within a GP, rather than dynamic according to context, which is what DPT suggests. Therefore a revised

approach, which places clinical reasoning and decision-making as a primary element preceding behaviour may help to understand why GPs i) report to use the term '*wear and tear*' or offer the patient glucosamine when they acknowledge these to be inaccurate or non-evidenced based, ii) use exercise when they are uncertain about the safety or efficacy of this approach, and iii) primarily refer patients with CKP to physiotherapists rather than other appropriate exercise or weight management services. However, the key influences on intuitive decision-making in the context of exercise for CKP are insufficiently known.

While the underpinning model was supported in part, further research is needed to validate or refine it further. While consideration of attitudes, beliefs and knowledge is essential, as these help GPs to identify the salient features of the problem (532), inform system 1 decisions (535) or may trigger a switch to analytical system 2 approaches (532), consideration of decision-making theory suggests that the underpinning model requires amendment. A proposed revised version of the theoretical model is presented in Figure 7-1 and is now described.

Figure 7-1 Revised model for examining GPs' attitudes and beliefs and behaviours



The revised underpinning theoretical model

The revised underpinning theoretical model outlined in Figure 7-1 continues to draw on three theoretical models explaining the associations between attitudes and behaviours: Godin's hypothesised theoretical framework (131), Pathman's awareness-to-adherence model (134) and the (now updated) TDF (531). For the sake of simplicity, the factors contained within the TDF which duplicate elements of the hypothesised theoretical framework have been removed from the figure. The purple lozenges added to the revised underpinning model in Figure 7-1 are elements that received inadequate focus during the development of the survey tool for this PhD and require explicit focus and investigation during future work, they are: the influence of the GPs' own uncertainty (within beliefs about consequences), perceptions of time limitations (within beliefs about capabilities) and patients' requests, preferences and traits (within social norms). Potentially relevant patient factors are provided in the hexagons in the expanded patient factors box within Figure 7-1. The revised model makes explicit the link between knowledge and habit/past behaviour that is described by schema theory, as this link possibly provides a way to identifying the role of habit/past behaviour in cross-sectional surveys. Recognising that CKP is of low interest and priority to GPs among respondents, who felt that managing the problem is their role, it is possible that some non-respondents may have negative beliefs about the candidacy of CKP for GP management. Further, 5% respondents to the main survey did normalise CKP when they described it to the patient. Potentially, negative beliefs about the candidacy of CKP may alter the performance of the underpinning model, or even stop GPs from entering the cognitive processes outlined in the model. While this hypothesis was

not proven by the results from the main survey, it is possible that those GPs who do not believe CKP is a condition requiring their address did not respond to the survey. This possible influence has been added in a light purple lozenge in front of the model for future consideration. The final significant change to the model is the inclusion of a final stage between behavioural intention and behaviour which is clinical reasoning, in particular, decision-making for the reasons described above.

Potential approaches for investigating the exercise behaviours of GPs using the revised underpinning theoretical model

In addition to GPs acting on gut feelings and intuition, decision-making seems to be based on internally derived typologies (complex schema based on '*averages'* or '*benchmarks*' which are combined with social and cognitive cues) (320). This perhaps indicates that the use of a single written vignette to understand behaviours may be insufficiently sophisticated as the cues that clinicians may use to make decisions may be under-represented. Indeed, system 1 decision-making in DPT is particularly influenced by visual information (532) thus indicating that future research may benefit from the use of video-taped vignettes or simulated patients. It may be necessary to use strategies to identify the cognitive processes (i.e. GPs' understanding of what is asked, retrieval of relevant information and decision-making and response processes (536)) occurring when completing questionnaires about behaviours (e.g. through cognitive interviewing (536) using think-aloud (participants instructed to *'think aloud'* as they respond (536)) and/or verbal probing techniques (in which the participant is asked specific questions to elicit details about how they approached their response (536,537))) or to test factors that may influence behaviour by using multiple video-taped vignettes that portray variations of potentially significant factors (321). For example, in the context of using exercise for

CKP, variations in patient vignettes or scenarios could be based on age, comorbidities, severity of pain or patient expectations or requests (which may individually impact the GP's perception of value of the use of exercise) or in complexity (which may trigger system 2 decision-making). Paskins et al (396) used video-stimulated recall to examine 19 unselected GP consultations (GPs n=15, practices n=7) which included OA to examine the language, explanations and exchanges that occurred. GPs were asked to describe their typical OA consultation, recall the video-recorded -consultation and, after viewing their consultation, discuss differences in recalled and observed events (396). This study richly investigated the dynamics between GPs and patients in areas identified by the current PhD, for example; problems with the way GPs communicate the diagnosis of OA, prioritisation of OA by GPs and patients and the difficulties of managing OA in the context of patients attending with multiple problems (396). However, this approach is resource intensive and intrusive for patients and GPs, thus the resulting small samples and likely social desirability bias inherent with using this type of approach are likely to be insufficient to comprehensively understand all the factors influencing GPs' decision-making. Pursuing this area of work seems to be of value in order to appropriately target interventions to reinforce the foundations upon which system 1 decisions are made, to alert GPs to potential cognitive biases (538) or to demonstrate the importance or complexity of the problem in order to prompt GPs to swap to system 2 decision-making (532).

7.3.2.2 Addressing problems with the adapted PABS_PT used in the context of GPs attitudes about CKP

The adapted PABS_PT tool was specifically highlighted as unacceptable and difficult to understand/answer by some GPs. Its value in measuring GPs' attitudes

about CKP was limited and previous work which used a reduced number of items also has not demonstrated that the tool can robustly predict GPs' behaviours (see Section 6.4.4). A recent exploratory factor analysis undertaken in the RICPHS investigating the structural validity of the tool in the context of LBP (physiotherapists and GPs) and knee pain (physiotherapists) found that the tool items work less well among GPs compared to physiotherapists (309). Thus, if the adapted PABS_PT tool, the most appropriate of all the available tools as outlined in Section 4.2.3., is not acceptable or of value for use among GPs in its current format in this context then alternative strategies for characterising GPs' attitudes about CKP and understanding and predicting GPs' behaviours need to be developed. The PABS_PT was included to establish whether GPs had attitudes and beliefs about the nature and significance of CKP that may preclude their use of exercise. Alternative methods for identifying such information may be possible, for example, using conjoint analysis (539). This method has been previously used to understand HCPs' clinical decision-making (540); however, it could be developed to establish patient variables which influence attitudes and beliefs. For example, cases depicting patients with CKP exhibiting different attributes (e.g. age, comorbidity, pain severity (and/or pain reported with exercise), BMI, treatments tried) in various combinations could be presented to different participating GPs, who are asked to respond with their beliefs about the safety and efficacy of exercises in each context. While a large sample of GPs may be needed to fully test the association of each patient attribute, the burden on individual GP participants may be lower, if only a small number of cases were presented (with only two associated questions regarding safety and efficacy of exercise) were presented to each.

7.3.3 Involvement of GPs in research

Results of this PhD suggest that involving GPs in questionnaire research is becoming increasingly problematic as a result of low response and there is an apparent trend towards lower GP responses to questionnaire surveys over time (328). Having a robust understanding of GPs' attitudes, beliefs and behaviours as well as a relevant evidence-base for primary care management approaches is crucial given that most formal healthcare occurs in primary care and GPs are keen to refer to relevant evidence when making decisions (191). While time limitations and survey length were particular barriers to participation reported by GPs choosing not to complete a pilot or main survey questionnaire, other factors such as scepticism or mistrust about research (including the use of the results), and lack of interest in participation were also reported barriers to involvement. These issues will now be briefly considered before recommendations for optimising GPs' involvement in research are provided.

7.3.3.1 Barriers to GPs participating in research

Consistent with previous literature (345,541), '*too little time*' was frequently cited as the reason for GPs responding to the pilot (93%) and main (87%) surveys with an MDS. GP workload is high, the patient-to-GP ratio is increasing and, the most deprived areas are often those most underserved by GPs (542), thus possibly explaining the observed differential in response according to deprivation status of the GPs' practice (see Table 6-4). Further, requests to participate in research are common (543) and compete with GPs' other non-clinical duties, such as CPD (541). While GPs are not alone in working in time-pressured healthcare environments, similar surveys among other HCPs often elicit greater response (174,178,180,187).

The cause for the lower response among GPs is uncertain. As generalists, they may be subject to higher numbers of requests to participate in survey research, research activity may be less ingrained among primary compared with secondary care or GPs may cite lack of time as a more socially desirable way to communicate lack of interest or negative attitudes towards research. Indeed previous empirical work has reported that even when GPs believe research to be important, this does not necessarily translate to engagement and GPs do not consistently perceive this to be within their role (541,544). A lack of interest in the topic of the research is also known to influence participation (256,257,339). Thus one would expect responders to be the most interested GPs. The low levels of clinical interest in CKP observed among respondents do suggest that research focussing on CKP may therefore be particularly liable to poor engagement by GPs. It is of concern that at least one GP raised previously identified suspicions about the motives of researchers, the value of research (541,544) and a suspicion that the results would be used to undermine patients' confidence in GPs. Some GPs appear to find participation in research threatening (392). Indeed, two GPs who chose not to complete a questionnaire stated that it was like an examination. Given that a Canadian study of family practitioners and gynaecologists reported a third of doctors had a policy of non-response to surveys (545), it does seem that further work to improve GP attitudes towards the nature and value of research in general is required in order to obtain generalisable results when undertaking future work in the context of GPs' management of CKP.

7.3.3.2 Recommendations for optimising GP involvement in research

A number of recommendations may address the low engagement in research observed in this survey and the barriers highlighted above. First, to maximise the likely capacity of GPs to participate in research, predictable fluctuations in workload should be accounted for when timing the mailings of questionnaire surveys. For example, avoiding Christmas and summer when many GPs may be on holiday and February-to-March when target-driven work is prioritised. For topics of low interest to GPs such as exercise for CKP, the value of the participation may need to be maximised (e.g. establishing meaningful incentives) or made explicit (e.g. highlighting the risks associated with other management options including paracetamol (546,547)) and protected time for research involvement may be required. While the effectiveness of financial incentives among GPs remains uncertain and may make large studies unfeasible, meaningful incentives may need to take other forms (e.g. linked to revalidation). Alternative approaches that reduce the burden of active involvement by GPs may be required to gather data about behaviours, for example, collecting routine consultation data. This again highlights the potential role of integrating templates into primary care electronic records (509).

7.4 Strengths and limitations of this research

This research provides new understanding of GPs' attitudes, beliefs and behaviours regarding exercise for CKP. Having developed an underpinning model derived from three behavioural theories, this PhD has identified not just what GPs are doing but has given insight into why, through establishing some of the factors that are significantly associated with GPs' clinical behaviour. Results have highlighted examples of good practice as well as areas of uncertainty, which particularly relate

to the safety and efficacy of (particularly local) exercises for CKP. Using a national UK sample of GPs meant that risk of bias from local service differences were mitigated, and it provided good insight into what GPs are doing in the UK, which may be different to that in other countries (441). These results should help to focus the development of education, behaviour change and organisational change interventions to improve the implementation of evidence-based care for patients with CKP, thus highlighting priority areas for further empirical research work. Although social desirability bias, response bias and prompting of responses using multiple response option questions are likely, risking overestimation of exercise behaviours, the data obtained are still valuable. At best, responses indicate robust estimates of exercise behaviours among GPs; that is, the adoption and/or adherence to guideline recommendations about the use of exercise as a core management for CKP. At worse, they provide an indication of behavioural intention or awareness of guideline recommendations (134). Given that the results have highlighted some evidence-practice gaps, then one can extrapolate these across the wider UK GP population as a focus for improving care, services and/or education, with many of the findings being relevant more widely than the UK alone.

However, some limitations are worthy of acknowledgement. The underpinning model was partially supported but there was insufficient focus within the questionnaire on certain elements of the model (see Section 7.3.2.1) and the model did not account for all influences on GPs' exercise behaviour, for example clinical reasoning and, specifically, decision-making theory. Thus some influences on GPs' behaviours remain insufficiently understood. Upon consideration of decision-making theory, it is possible that a further limitation linked to the choice of survey methodology is that the very act of completing a questionnaire may well trigger GPs

to use system 2 decision-making and thus responses may not accurately reflect behaviours and/or thought processes occurring in the real context of a GP consultation and associated time pressures. To avoid this would require observation of simulated or real consultations in the context of a normal GP surgery (see Section 4.1.1 for drawbacks of these methodologies). Use of the adapted PABS_PT, although important to investigate the value of this tool in this context, may have contributed to the low response obtained in both the pilot and main surveys as GPs (including those responding with a completed questionnaire) provided feedback that this tool was unacceptable and difficult to answer. This tool added a whole page to the questionnaire. The low response, risk of social desirability bias using self-report measures, the uncomplicated nature of vignette patient and, possibly, GPs switching to analytical decision-making while answering the questionnaire, have probably led to an overestimation of the use of exercise for CKP among the general GP population.

7.5 Conclusions

The overall aim of this PhD was to investigate GPs' attitudes, beliefs and behaviours regarding exercise for CKP. Following a systematic review, which indicated overall underuse of exercise and a variety of attitudes about exercise for CKP, and development of a pilot study, the main cross-sectional survey found that most GPs report using exercise for this patient group. However, exercise initiation was suboptimal and would not consistently lead to timely use of individualised local and general exercise as soon as the consultation has finished. Perceptions about the use of follow-up, and whose role this is, were variable and the language used to describe CKP to patients may serve to undermine the positive and appropriate

advice given to exercise. Although the underpinning model helped to identify attitudes and beliefs that were associated with the use of exercise by GPs, associations were not always consistent with the underlying theories. These findings should help to focus future educational, behaviour change and organisational change interventions relating to CKP and have informed revisions to the model that further research could consider and test. However, the optimum strategies to support GPs to initiate exercise in to the management of patients with CKP who present to primary care are so far uncertain. Testing the impact of possible strategies in the context of low levels of engagement of GPs with survey based research will require the development of methods to undertake primary care research in ways that minimise the additional work and burden on GPs while obtaining complete datasets about the comprehensive care provided by a large number of these individuals (e.g. using primary care medical record databases).

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Appendix 1: Guideline summaries

Table I-A Examples of guidelines pertaining to the management of CKP: a summary of the target audience, 'core' management recommendations

Guideline	Target audience	First line 'core' management recommendations
OARSI guidelines for the non-surgical management of knee OA (72)*	Patients, physicians and allied HCPs worldwide	Land-based exercise Strength training Water-based exercise Self-management and education Weight management
NICE Clinical Guideline, Osteoarthritis: the care and management of OA in adults (2)**	All HCPs in UK, primarily England	Education, advice, information access Strengthening exercise, aerobic fitness training Weight loss if overweight or obese
EULAR recommendations for the non-pharmacological core management of hip and knee OA (47)***	All HCPs in Europe	Information and education regarding OA Addressing maintenance and pacing of activity Addressing a regular individualised exercise regimen Addressing weight loss if overweight or obese Reduction of adverse mechanical factors (e.g. appropriate footwear) Consideration of walking aids and assistive technology
Treatment of OA of the knee (non-arthroplasty) (548)	Orthopaedic surgeons All qualified physicians managing patients with knee OA in the USA	Self-management educational programs Activity modifications to lifestyle Regular contact to promote self-care Weight loss if overweight Exercises Analgesics
Stepped model of care (549)	Primary care health professionals in the UK	Weight loss Paracetamol Written information SYSADOA Thermotherapy Sleep advice Exercise

The MOVE consensus (50)	HCPs caring for patients with OA in the UK	Exercises are defined as a 'core aspect' of managing every patient
Management of osteoarthritis in the primary-care setting (42)	Primary care physicians in the USA	Drug therapy: preferably paracetamol, NSAIDs in non-responders, opioids for increased pain or 'flares' Non-pharmacologic therapy (alongside drug therapy) Education Assistive devices Physical therapy Conditioning exercises Weight loss

* Updated the 2008 guidelines (550). ** With no change to shown content after the update of the 2008 guideline which was in place at the start of this project (357). ***Updated the 2003 guidelines with a change in target audience from secondary care to all HCPs and these guidelines solely focus on non-pharmacological approaches (551). AAOS = American Academy of Orthopaedic Surgeons; EULAR = European League Against Rheumatism; HCPs = healthcare professionals; NICE = National Institute for Health and Care Excellence; NSAID = Non-steroidal anti-inflammatory drug; OA = osteoarthritis; OARSI = Osteoarthritis Research Society International; SYSADOA = glucosamine, chondroitin, diacerein, avocado-soya unsaponifiables; USA = United States of America

Table I-B Summary of specific information about the use of exercise provided in a selection of CKP guidelines

Guideline	Details of information on exercises
OARSI guidelines for the non-surgical management of knee OA (72)*	Land-based, strength training and water-based exercise deemed appropriate for patients with single and multi-joint OA both with and without comorbidities. The risk-benefit scores were also the best of all treatment options considered in the guideline for patients with single and multi-joint OA both with and without comorbidities, only matched in magnitude by weight loss.
NICE Clinical Guideline, Osteoarthritis: the care and management of OA in adults (2)**	Exercise should: Be a core treatment for people with OA, irrespective of: age, comorbidity, pain severity, disability Include local muscle strengthening and general aerobic fitness Not specified whether: Exercise should be provided by the NHS HCPs 'should provide advice and encouragement to the patient to obtain and carry out the intervention themselves'
EULAR recommendations for the non-pharmacological core management of hip and knee OA (47)***	The mode of delivery of exercise education (e.g. individual 1:1 sessions, group classes etc.) and use of pools or other facilities should be selected according to both the preference of the person and local availability Important principles of all exercise include: Small amounts often (pacing, as with other activities) Linking exercise regimens to other daily activities so they become part of lifestyle rather than additional events Starting with levels of exercise that are within the individual's capability but building up the dose sensibly over several months People should be taught a regular individualised (daily) exercise regimen that includes: Strengthening (sustained isometric) exercise for both legs, including quadriceps and proximal hip girdle muscles Aerobic activity and exercise Adjunctive range-of-movement/stretching exercises Although initial instruction is required, the aim is for people to learn to undertake these regularly on their own in their own environment
Treatment of OA of the knee (non-arthroplasty) (548)	Patients should be encouraged to participate in low-impact aerobic fitness exercises Range of motion/flexibility exercises are an option Suggest quadriceps strengthening
Stepped model of care (549)	Exercise was recommended as a management strategy for all patients with CKP Physiotherapy was a second line intervention if pain or disability was persisting despite the use of other interventions
The MOVE consensus (50)	Strengthening and aerobic exercise can reduce pain and improve function, health status and proprioception, which may reduce progression There are few contraindications to the prescription of strengthening or aerobic exercise Prescription of both general (aerobic fitness training) and local (strengthening) exercises is an essential, core aspect of management for every patient Exercise should be individualised, patient centred and take into account factors such as age, comorbidity, overall mobility

	To be effective, exercise programmes should include advice and education to promote a positive lifestyle change with an increase in physical activity Group exercise and home exercise are equally effective and patient preference should be considered Adherence is the principal predictor of long term outcome from exercise– strategies to improve and maintain adherence should be adopted The effectiveness of exercise is independent of the presence or severity of radiographic findings
Exercise prescription for older adults with OA pain (15)	Encouraging regular exercise may: Reduce morbidity and mortality (in sedentary OA patients) Reduce the physical impairments and the burden of comorbidities Improve quality of life Decrease pain Improve function – including postural and gait stability, thus reducing the risk of falls
Recommendations for the medical management of OA of the hip and knee (552)	Physical therapy plays a central role in the management of patients with functional limitations A physical therapist instructs patients in an exercise program to maintain or improve joint range of motion and periarticular muscle strength Exercise can improve muscle strength, mobility, coordination, proprioception and performance of activities of daily living. It can reduce pain, disability, the amount of analgesia required and the number of appointments with a doctor
Management of osteoarthritis in the primary-care setting (42)	Physical therapists should instruct patients in exercise programs to maintain or improve joint range of motion and muscle strength Aerobic conditioning exercises have also been found to be feasible and efficacious Individuals who exercise regularly develop functional disabilities at a significantly slower rate

CKP = chronic knee pain; EULAR = European League Against Rheumatism; HCPs = healthcare professionals; NHS = National Health Service; NICE = National Institute for Health and Care Excellence; OA = osteoarthritis; OARSI = Osteoarthritis Research Society International; USA = United States of America

Appendix 2: Summary of studies specifically looking at the theory of planned behaviour among GPs

Study	Population	Context	Behavioural intention or behaviour (% variance explained by TPB)	Particularly predictive constructs
Kinket (553)	49 GPs in Arnhem-Achterhoek, Netherlands	Attitudes about patient education by GPs	Behavioural intention	Attitudes
Godin (139)	852GPs, medical specialists and surgeons of Québec, Canada	Performing a clinical examination of an HIV patient and to refer the patient to a colleague for clinical examination	Behavioural intention	Attitude Social norm
Godin (141)	720 GPs, medical specialists and surgeons of Québec, Canada	Wearing gloves when contact with blood or body fluids possible	Behavioural intention	Perceived behavioural norm Attitudes Perceived behavioural control
Millstein (140)	765 primary care physicians in California	Educating adolescents about sexually transmitted disease and HIV transmission	Behavioural intention (27%)	Attitudes Social norms Perceived behavioural control [Perceived behavioural control significantly improved prediction]
			Actual behaviour (39%)	Social norms Perceived behavioural control [Perceived behavioural control appeared to have a direct effect]
Conner(554)	65 GPs in Bradford, UK	Referral of Asian and non-Asian patients to mental health services	Behavioural intention	Asian patients: social norms Non-Asian patients: attitudes about outcome

Busha (555)	Unknown number* of family physicians in the USA	Providing preventive reproductive healthcare information during routine examinations of adolescent boys and girls	Behavioural intention	Perceived behavioural control Subjective norm
Walker (142)	126 GPs in one NHS region	Prescribing antibiotics for an adult patient with an uncomplicated sore throat	Behavioural intention (48%)	Attitudes Perceived behavioural control
Legare (143)	334 GPs (and 130 gynaecologists) in Quebec, 425 GPs (and 586 gynaecologists) in France	Prescribing hormone therapy	Behavioural intention	GPs from Quebec - Power of control beliefs** - Moral norm GPs from France - Power of control beliefs** - Role beliefs - Perceived behavioural control
Bonetti (170)	152 GPs in England and Scotland	Referring for lumbar spine x-ray in patients presenting with back pain	Behavioural intention (30%)	Perceived behavioural control Attitude
			Reported behaviour (14%)	Perceived behavioural control Social norm Attitude
Eccles (138)	230 GPs in Scotland in 2004	Managing upper respiratory tract infections without antibiotics	Behavioural intention (30%)	Attitudes Perceived behavioural control [Constructs retained in cross-theory analysis]
			Reported behaviour (31%)	Attitudes Perceived behavioural control Intention [Perceived behavioural control retained in cross-theory analysis]
			Actual behaviour (3%)	Attitudes Intention Perceived behavioural control [No constructs from TPB retained in cross-theory analysis]

Legare (144)	121 clinical teachers residents in family medicine in Ottawa, Canada	Screening for decisional conflict	Behavioural intention	Attitudes (only at entry to, not exit of, the study) Subjective norm Perceived behavioural control
Godin (145)	201 GPs, 144 family medicine residents and 369 4th year medical students in French speaking areas of Québec, Canada	Encouraging a patient to follow complementary and alternative medicine treatment	Behavioural intention (75% among all three groups)	Attitude Moral norm Perceived behavioural control
Kortteisto (147)	806 physicians, nurses and other HCPs in Finland in 2006/7	Using clinical guidelines	Behavioural intention (48% among all physicians)	Perceived behavioural control [Less intention was identified among primary care physicians to use clinical practice guidelines than among secondary care physicians]
Grimshaw (148)	299 GPs in Scotland and north England	Referring for lumbar spine x-ray in patients presenting with low back pain	Behavioural intention (25%)	Attitude Subjective norm Perceived behavioural control [Perceived behavioural control retained in cross-theory analysis]
			Reported behaviour (12%)	Attitudes Social norms Perceived behavioural control Intention [Perceived behavioural control retained in cross-theory analysis]
			Actual behaviour	Attitude Perceived behavioural control Intention [Attitudes retained in cross-theory analysis]
Rashidian (149)	155 GPs in England in 2002	Prescribing statins	Behavioural intention (45%)	Attitude Perceived behavioural control
			Actual behaviours – efficient prescribing	Belief variables were retained within the final model
			Actual behaviours – effective prescribing	None of the direct or indirect TPB variables significantly explained variation in effective prescribing indicator
Rashidian (150)	94 GPs in England in 2002	Prescribing for asthma	Behavioural intention (43%)	Perceived behavioural controls

	Actual behaviours – efficient prescribing	Belief variables contributed to explanations of variance
	Actual behaviours – effective prescribing	None of the direct or indirect TPB variables significantly explained variation in effective prescribing indicator

*Full text of thesis unavailable – information obtained from abstract only. ** In the underlying theory power of control beliefs led to perceived behavioural control. GP = general practitioners; HCP = healthcare professionals; HIV = human immunodeficiency virus; TPB = theory of planned behaviour; UK = United Kingdom; USA = United States of America

Appendix 3: Literature search supplementary information

Table III-A Search terms used in the literature review

Criteria	Search terms used (each term within a criteria combined with Boolean Operator "OR" unless stated otherwise)
Chronic Knee Pain	("Knee"; "Knee joint") AND ("Pain"; "Osteoarthritis"; "Arthritis"; "Chronic pain"; "Pain assessment"; "Musculoskeletal pain"; "Pain measurement") OR "Knee osteoarthritis"; "Knee arthritis"; "Knee pain"; "Chronic knee pain"; "Osteoarthritis, knee"
Exercise	"Aerobic exercise" ; "Dance therapy" ; "Dynamic exercise" ; "Exercise" ; "Exercise therapy"; "Motion therapy"; "Motor activity"; "Movement techniques"; "Movement therapy"; "Muscle stretching exercises"; "Physical activity"; "Physical therapy"; "Quadriceps strengthening"; "Static exercise"; "Strengthening exercises"; "Tai Chi"; "Therapeutic exercise" ; "Walking"; "Yoga"
General practitioners	"Family medicine"; "Family physicians"; "Family practice"; "General practitioner"; "General practice"; "Physicians, family"; "Physicians, primary care"; "Primary care"; "Primary health care"; "Primary" and "healthcare"; "Primary medical care"; "Primary healthcare"
Attitudes, beliefs	"Attitude" or "Attitudes"; "Attitude of health personnel"; "Belief" or "Beliefs"; "Health personnel attitude"; "Perception" or "perceptions"; "Physician attitude"
Behaviours	"Adherence to guidelines"; "Approaches"; "Behaviours"; "Clinical practice"; "Case management"; "Disease management"; "Management"; "Medical treatment"; "Medical audit"; "Medical Practice"; "Pain management"; "Physicians Practice patterns"; "Prescription"; "Treatment Orientations"
Search terms were combined as follows: Chronic knee pain AND Exercise AND General Practitioners AND (Attitudes, beliefs OR Behaviours)	

Table III-B Summary of near misses and reasons for this classification

Author, year	Country of study	Reason for exclusion from systematic review			
		Actions of GP uncertain	CKP data combined with other joints	Relevance of sample uncertain	CKP did not meet with PhD definition
Allen et al, 2014 (106,272)	USA	✓		✓	
Gronhaug et al, 2014 (556)	Norway	✓			
Haskins et al, 2014 (119)	Australia		✓		
Healey et al, 2014 (385)	UK		✓		
Hinman et al, 2014 (557)	Australia	✓			
Sheikh et al, 2014 (267)	UK	✓			
Smink et al, 2014 (263,264)	Netherlands		✓		
O'Donnell et al, 2013 (429)	Canada	✓			✓
Osteras et al, 2013 (558,559)	Norway	✓	✓		
Smink et al, 2013 (322,560)	Netherlands		✓		
Smink et al, 2013 (561)	Netherlands		✓		
Gore et al, 2012 (271)	USA	✓	✓		
Homoud et al, 2012 (265)	Saudi Arabia		✓		
Kingsbury et al, 2012 (167)	UK		✓		
McDonald et al, 2012 (155)	USA		✓		
Snijders et al, 2011 (270)	Netherlands	✓	✓		
Li et al, 2011 (562)	Canada	✓	✓		
Mann et al, 2011(394)	UK		✓		✓
McHugh et al, 2011 (563)	UK	✓	✓		
Conrozier et al, 2008(261)	France	✓	✓		
Mitchell et al, 2008(269)	UK	✓			
Rosemann et al, 2008 (262)	Germany		✓		
Jinks et al, 2007(100)	UK				✓
Rosemann et al, 2006 (186)	Germany		✓		
Ganz et al, 2006 (260)	USA	✓			
Li et al, 2004 (85)	Canada	✓			
Glazier et al, 2003(258)	Canada			✓	
Tallon et al, 2000(54)	UK	✓			
Hopman-Rock,1997(268)	Netherlands	✓	✓		
Traynor et al, 1994 (273)	Australia		✓		

CKP = chronic knee pain; GP = general practitioner; UK = United Kingdom; United States of America

Table III-C Quality assessment tool: The Newcastle Critical Appraisal Worksheet (NCAW)

Questions to ask → / Points to consider ↓	Can you find this information in the paper?	Is the way this was done a problem?	Does this problem threaten the validity of the study?
What is the research question?		Is it concerned with the impact of an intervention, causality or determining the magnitude of a health problem?	Is it a well stated research question/hypothesis?
What is the study type?		Is the study type appropriate to the research question?	If not, how useful are the results produced by this type of study?
What are the outcome factors and how are they measured?		Are all relevant outcomes assessed? Is there a measurement error	How important are omitted outcomes? Is measurement error an important source of bias?
What are the study factors and how are they measured?		Is there a measurement error?	Is measurement error an important source of bias?
What important confounders are considered?		Are potential confounders examined and controlled for?	Is confounding an important source of bias?
What are the sampling frame and sampling method?		Is there selection bias?	Does this threaten the external validity of the study?
Questions of internal validity		In an experimental study, how were the subjects assigned to groups? In a longitudinal study, how many reached final follow-up? In a case control study, are the controls appropriate? (Etc.)	Does this threaten the internal validity of the study?
Are statistical tests considered?		Were the tests appropriate for the data? Are CIs given? Is the power given if a null result? In a trial, are results presented as absolute risk reduction as well as relative risk reduction?	If not, how useful are the results?
Are the results clinically/socially significant?		Was the sample size adequate to detect a clinically/socially significant result? Are the results presented in a way to help in health policy decisions?	Is the study useful?
Is the study ethical?		Does the paper indicate ethics approval? Can you identify potential ethical issues?	Are the results or their application compromised?
What conclusions did the authors reach about the study question?		Do the results apply to the population in which you are interested?	Will you use the results of the study?

CI = confidence interval

Table III-D Quality assessment tool: The Critical Appraisal Skills Programme (CASP) Qualitative Research Assessment Tool

Question	Consider
Screening questions	
Was there a clear statement of the aims of the research?	What was the goal of the research? Why is it important? What is its relevance?
Is a qualitative methodology appropriate?	Does the research seek to interpret or illuminate the actions and/or subjective experiences of research participants?
Is it worth continuing (i.e. positive response to both screening questions)?	
Was the research design appropriate to address the aims of the research?	Has the researcher justified the research design (e.g. have they discussed how they decided which methods to use?)?
Was the recruitment strategy appropriate to the aims of the research?	Has the researcher explained how the participants were selected? Have they explained why the participants they selected were the most appropriate to provide access to the type of knowledge sought by the study? Are there any discussions around recruitment (e.g. why some people chose not to take part)?
Were the data collected in a way that addressed the research issue?	Is the setting for data collection justified? Is it clear how data were collected (e.g. focus group, semi-structured interview etc.)? Has the researcher justified the methods chosen? Has the researcher made the methods explicit (e.g. for interview method, is there an indication of how interviews were conducted, did they use a topic guide?)? Were the methods modified during the study, if so, has the researcher explained how and why? Is the form of data clear (e.g. tape recordings, video material, notes etc.)? Has the researcher discussed saturation of data?
Has the relationship between researcher and participants been adequately considered?	Has the researcher critically examined their own role, potential bias and influence during i) formulation of the research questions, ii) data collection, including sample recruitment and choice of location? How has the researcher responded to events during the study and have they considered the implications of any changes in the research design?
Have ethical issues been taken into consideration?	Are there sufficient details of how the research was explained to participants for the reader to assess whether ethical standards were maintained? Has the researcher discussed issues raised by the study (e.g. issues around informed consent or confidentiality or how they have handled the effects of the study on the participants during and after the study)? Has approval has been sought from the ethics committee?
Was the data analysis sufficiently rigorous?	Is there an in-depth description of the analysis process? If thematic analysis is used, is it clear how the categories/themes were derived from the data? Does the researcher explain how the data presented were selected from the original sample to demonstrate the analysis process? Are sufficient data presented to support the findings? To what extent are contradictory data taken into account? Has the researcher critically examined their own role, potential bias, and influence during analysis and selection of data for presentation?
Is there a clear statement of findings?	Are the findings explicit? Is there adequate discussion of the evidence both for and against the researchers' arguments? Has the researcher discussed the credibility of their findings (e.g. triangulation, respondent validation, more than one analyst)? Are the findings discussed in relation to the original research questions?
How valuable is the research?	Has the researcher discussed the contribution the study makes to existing knowledge or understanding (e.g. do they consider the findings in relation to current practice or policy, or relevant research-based literature?)? Have they identified new areas where research is necessary? Have the researchers discussed whether or how the findings can be transferred to other populations or considered other ways the research may be used?

Appendix 4: Use of the ABC-Knee study attitude statements

Table IV-A Use of the adapted PABS_PT attitude statements

PABS_PT Attitude Statement	Statement used in the ABC-Knee Study	Statement used in pilot questionnaire
Biomedical subscale		
The severity of tissue damage determines the level of pain	Same as original	Same as original
Increased pain indicates new tissue damage or the spread of existing damage		
Pain is a nociceptive stimulus indicating tissue damage		
If back pain increases in severity, I immediately adjust the intensity of my treatment accordingly	If chronic knee pain increases in severity, I immediately adjust the intensity of my treatment accordingly	Same as ABC-Knee Study investigating physiotherapists
If patients complain of pain during exercise, I worry that damage is being caused	Same as original	Same as original
Patients with back pain should preferably practice only pain free movements	Patients with chronic knee pain should preferably practice only pain free movement	Same as ABC-Knee Study investigating physiotherapists
Pain reduction is a precondition for the restoration of normal functioning	Same as original	Same as original
If therapy does not result in a reduction in back pain, there is a high risk of severe restrictions in the long term	If therapy does not result in a reduction in chronic knee pain, there is a high risk of severe restrictions in the long term	Same as ABC-Knee Study investigating physiotherapists
Back pain indicates the presence of organic injury	Chronic knee pain indicates the presence of organic injury	
In the long run, patients with back pain have a higher risk of developing spinal impairments	In the long run, patients with chronic knee problems have a higher risk of developing severe functional impairments	
Behavioural subscale		
Learning to cope with stress promotes recovery from back pain	Learning to cope with stress promotes recovery from chronic knee problems	Same as ABC-Knee Study investigating physiotherapists
A patient suffering from severe back pain will benefit from physical exercise	A patient suffering from a severe chronic knee problem will benefit from physical exercise	
Even if the pain has worsened, the intensity of the next treatment can be increased	Same as original	Same as original
Exercises that may be back straining should not be avoided during the treatment	Exercises that may be knee straining should not be avoided	Same as ABC-Knee Study investigating physiotherapists
Therapy may have been successful even if pain remains	Same as original	Same as original

The cause of back pain is unknown	The cause of chronic knee problems is unknown	Same as ABC-Knee Study investigating physiotherapists
Functional limitations associated with back pain are the result of psychosocial factors	Functional limitations associated with chronic knee problems are the result of psychosocial factors	
There is no effective treatment to eliminate back pain	There is no effective treatment to eliminate chronic knee problems	
Mental stress can cause back pain even in the absence of tissue damage	Mental stress can cause chronic knee problems even in the absence of tissue damage	

Table IV-B Use of the MOVE attitude statements

MOVE Consensus Statement(6)	Attitude statement used in the ABC-Knee Study	Attitude statement used in pilot study	Reason for change/comment
Items relating to the benefits of exercise			
Both strengthening and aerobic exercise can reduce pain and improve function and health status in patients with knee and hip OA	Knee problems are improved by local strengthening exercises	Knee problems are improved by quadriceps strengthening exercises	Changed to improve clarity among GPs who may not be familiar with physiotherapy language
	Knee problems are improved by general exercise, for example walking or swimming	Knee problems are improved by general exercise, for example walking or swimming	_____
There are few contraindications to the prescription of strengthening or aerobic exercise in patients with hip or knee OA	Local strengthening exercises for the knee are safe for everybody to do	Quadriceps strengthening exercises for the knee are safe for everybody to do	Changed to improve clarity among GPs who may not be familiar with physiotherapy language
	General exercise, for example walking or swimming is safe for everybody to do	General exercise, for example walking or swimming is safe for everybody to do	_____
	Exercise works just as well for everybody, regardless of the amount of pain they have	Exercise works just as well for everybody, regardless of the amount of pain they have	_____
Prescription of both general (aerobic fitness training) and local (strengthening) exercises is an essential, core aspect of management for every patient with hip or knee OA	Physiotherapists should prescribe local strengthening exercises to every patient with chronic knee pain	GPs should prescribe quadriceps strengthening exercises to every patient with chronic knee pain	Changed to improve clarity among GPs who may not be familiar with physiotherapy language
	Physiotherapists should prescribe general exercise, for example walking or swimming, for every patient with chronic knee pain	GPs should prescribe general exercise, for example, walking or swimming, for every patient with chronic knee pain	Change focus to GPs

The effectiveness of exercise is independent of the presence or severity of radiographic findings	Exercises are effective for patients if an x-ray shows mild knee osteoarthritis	_____	The first two statements were removed in the interests of brevity. The crux of these questions relates to whether GPs will feel it is safe and/or appropriate for patients to exercise a knee with "severe" osteoarthritis changes.
	Exercises are effective for patients if an x-ray shows moderate knee osteoarthritis	_____	
	Exercises are effective for patients if an x-ray shows severe knee osteoarthritis	Exercise is effective for patients if an x-ray shows severe knee osteoarthritis	
Improvements in muscle strength and proprioception gained from exercise programmes may reduce the progression of knee and hip OA	Increasing the strength of the muscles around the knee stops the knee problems getting worse	Increasing the strength of the muscles around the knee stops the knee problem getting worse	_____
	Increasing overall activity levels stops the knee problem getting worse	Increasing overall activity levels stops the knee problem getting worse	_____
Items relating to the delivery of, and adherence to, exercise			
Exercise therapy for OA of the hip or knee should be individualized and patient-centred taking into account factors such as age, comorbidity and overall mobility	Exercise for chronic knee problems is most beneficial when it is tailored to meet individual patient needs	Exercise for chronic knee pain is most beneficial when it is tailored to meet individual patient needs	_____
	A standard set of exercises is sufficient for every patient with chronic knee problems	A standard set of exercises is sufficient for every patient with chronic knee problems	_____
To be effective, exercise programmes should include advice and education to promote a positive lifestyle change with an increase in physical activity	Physiotherapists should educate chronic knee pain patients about how to change their lifestyle for the better	GPs should educate chronic knee pain patients about how to change their lifestyle for the better	Change focus to GPs
	It is important that people with chronic knee problems increase their overall activity levels	It is important that people with chronic knee pain increase their overall activity levels	_____
Group exercise and home exercise are equally effective and patient preference should be considered	Exercise for chronic knee problems is most effective if done in a group setting	_____	It was thought that these questions were not relevant to GPs who may not have very much say about whether patients undergo home or group exercise. This view was supported by discussion by local GPs during the vignette pilot.
	Exercise for chronic knee problems is most effective if done as a home programme	_____	
	The patient is the best person to	_____	

	decide whether they should do their exercise at home or in a group setting		
	A physiotherapist is the best person to decide whether a patient should do their knee exercise at home or in a group setting	_____	
Adherence is the principal predictor of long term outcome from exercise in patients with knee or hip OA	How well a patient complies with their exercise programme determines how effective it will be	How well a patient complies with their exercise programme determines how effective it will be	_____
Strategies to improve and maintain adherence should be adopted, e.g. long term monitoring/review and inclusion of spouse/family in exercise	It is the physiotherapist's responsibility to make sure that the patient will continue doing their exercise programme	GPs should follow-up patients to monitor extent of continuation of exercises	Change focus to GPs Changed as a result of feedback from the pilot among local GPs.
	It is the patient's own responsibility to continue doing their exercise programme	It is the patient's own responsibility to continue doing their exercise programme	_____
----------	----------	Exercise for chronic knee pain is only effectively provided by physiotherapists	Added to indicate the perceived role of GPs in providing exercise and/or the certainty of GPs in their ability to provide useful exercise advice
----------	----------	Time constraints prevent GPs from providing advice on individual exercises for chronic knee pain	Added to address potential system factors restricting the use of exercise in this patient group
----------	----------	Exercise for chronic knee pain should only be used after drug treatment has been tried	Added to assess if GPs see exercise as an option to try once other more "simple" or perhaps less "resource intensive" treatments have been attempted, for example painkillers
----------	----------	Exercise for chronic knee pain would be used more frequently if access to physiotherapy was easier	Added to address potential system factors restricting the use of exercise in this patient group

Appendix 5: Vignette pre-testing

Table V-A Four vignettes used for pre-testing

Characteristic of the patient	Vignette used in pre-testing
Multiple comorbidities	A 74-year-old retired optical worker presents to you with an 11-year history of bilateral knee pain that is worse on the left. The pain started suddenly without any history of trauma. Although she describes multiple joint pains, it is her left knee pain that troubles her the most. Today she describes the severity of her pain as being 4 out of 10. She states her knee aches most of the time. However, her pain is aggravated while climbing and descending stairs. She is often woken by her pain and complains bitterly of the lack of sleep she is experiencing. She describes early morning stiffness of less than 30 minutes duration and stiffness after rest. She often has sharp, transient pains in her left knee and on a couple of occasions her knee has given way. She is well known to you as she has multiple medical problems. In addition to being overweight, she has hypothyroidism, diabetes mellitus and hypertension. She often complains of shortness of breath and indigestion. Currently she is taking, thyroxine, diuretics, antihypertensives, a statin and celecoxib. On examination of her knees, you find only anteromedial swelling on the left side. She has pain on compression and glide pain at the left patellofemoral joint. She has diffuse tenderness to palpation, more so on the left than the right. You note left medial and anterior-posterior joint laxity with bilateral reduction of knee flexion and bilateral crepitus on movement, the left being worse than the right.
WOMAC function score 20 (mild functional impairment)	A 68-year-old retired Prison Officer presents to you with a 2-year history of gradually worsening bilateral knee pain that affects the right knee more than the left. There is no history of trauma. Today he describes the severity of his pain as being 5 out of 10. His pain remains stable when walking and at rest but is aggravated by climbing stairs. He is not woken at night by his pain, but describes increased stiffness in his knees when he first wakes and following rest. He manages his activities of daily living independently, although he has some difficulties gardening. He used to attend the gym, but has stopped going as it increases the pain and he believes this is the cause for his problem. Despite being overweight, he enjoys good health and you usually only see him to monitor his medication for hypertension and hypothyroidism. He has tried ibuprofen when his knees “really hurt” but because he has not gained relief from this he has come today to find out what else you can do for him. On examination of his knees you find he has no swelling of the knees and no joint laxity. However he does have bilateral coarse crepitations, bilateral tibio-femoral joint line tenderness and reduced flexion of the right compared to the left knee.
WOMAC function score 30 (moderate functional impairment)	A 63-year-old retired accounts clerk presents to you with a 3-year history of gradually worsening bilateral knee pain that affects the right knee more than the left. There is no history of trauma. Today she describes the severity of her pain as being 7 out of 10. Her pain remains stable on walking and at rest, but is aggravated by climbing stairs, walking up hill and gardening. The pain wakes her at night and the stiffness is particularly bad first thing in the morning. Previously she has had problems with her shoulders, hands and back and she believes the latter has caused her current knee pain. She has no past medical history except mild dermatitis on her hands so is on no regular medication except for codydramol, which is not adequately controlling her symptoms. She has come to see you today to find out what else you could give her to manage her pain. On examination of the knees she has a right prepatellar swelling and bilateral anteriomedial swelling. She has diffuse joint tenderness on the right side and medial joint line tenderness on the left. She has right anterior-posterior joint laxity and bilateral reduced flexion. Both knees exhibit coarse crepitations on movement. You calculate her BMI to be 28.

WOMAC function score 40 (severe functional impairment)	A 64-year-old retired shop manageress presents to you with a 4-year history of gradually worsening left knee pain associated with a lot of swelling and intermittent, transient sharp pains. Although she has previously had problems with her back, elbows, hands and hips, it is her knee that is causing the most trouble. There is no history of trauma. Today she describes the severity of her pain as 6 out of 10. Her pain remains stable while walking on the flat but is aggravated when descending stairs. She is now unable to bend to the floor, get in and out of the bath and struggles to rise from sitting. She has no night pain, but describes severe early morning stiffness lasting over 30 minutes. She believes that her current problems are down to aging, especially since joint pain is “in the family”, and is concerned that she has made matters worse because she used to be a keen swimmer. She is overweight and has hypertension and asthma. Her reduced mobility and inability to undertake her normal daily activities with ease, as well as her constant pain, has made her feel low and this has triggered her consultation with you today. She asks you to help her to regain “a normal life”. On examination of her knees you notice mild swelling associated with diffuse tenderness across the entire left knee. You detect left anterior-posterior and lateral joint laxity and bilateral medial laxity. The left knee has significantly reduced flexion than the right. There is coarse crepitus on movement of the left knee only.

Table V-B GP responses to vignette pre-testing questions

		Vignette 1 WOMAC Score 30	Vignette 2 WOMAC Score 20	Vignette 3 Multiple comorbidities	Vignette 4 WOMAC Score 40
Is the case realistic?	Yes	n = 5	n = 5	n = 5	n = 5
	Comments	Examination – probably too detailed Scoring system 7/10 – don't tend to use in GP Patient attributing knee pain to back? Older or GPs not interested in this may not pick up details of swelling etc. in their own examination	Pain scoring!	Long history, not sure why presenting now, pain intensity score does not tally with description Age and job always relevant More detailed pain history. Type of pain. "You find only" [in vignette] does this imply it may be a non-significant finding	Given explanations of what important to patient ADLs important to help work out what patient needs
Did anything cause confusion?	Yes	n = 1	n = 0	n = 3	n = 0
	Comments	Knowing definite areas of swelling Duration of early morning stiffness Nature of previous problems with back, hands and shoulders	Bilat coarse creps? ?Relevance 'overweight' BMI helpful	Low pain score Defining 'giving way' Unless you have a special interest, GP may not know what glide pain is	
Could the case have been describing any other condition?	Yes	n = 1	n = 0	n =0	n = 1
	Comments	Early morning stiffness = ?inflammatory arthropathy Assume describing OA Fairly typical OA but ?inflammatory arthropathy or gout polyarthropathy	Assume describing OA	Assume OA	Quite bad early morning stiffness and positive family history of inflammatory arthritis ?Inflammatory arthropathy given early morning stiffness >30 minutes and family history

Could you make informed clinical decisions based on the information provided?	Yes	n = 5	n = 4	n = 5	n = 4
	Comments	Assumptions of OA, would require x-rays and bloods. Hobbies and exercise ability	Bloods and x-rays BMI Anti-hypertensive medication	X-rays and bloods	Bloods and x-rays Previous physiotherapy, analgesics
Was any information included that you feel is *not* required?	Yes	n = 1	n = 0	n = 1	n = 1
	Comments	Some exam findings		Exam findings	In general they could be a bit shorter Also, mental health/mood description
Other comments		Reduce examination findings	Weight ?BMI – but this wouldn't affect management, except if considering referral, there may be PCT limitations on being able to refer if over a certain BMI	Shorten	
N = 6, although one GP did not answer 'yes' or 'no' for any questions but provided comments					

Appendix 6: Summary of how pilot questionnaire items map to the underpinning model

Element of the underpinning model		Item(s) in study tool relating to this factor
Beliefs about consequences	Awareness of management recommendations	Q5.1 How much have you heard about or read the guideline published by NICE in 2008 for the care and management of osteoarthritis in adults? Q4.7 Exercise for chronic knee pain is most beneficial when it is tailored to meet individual patient needs Q4.8 A standard set of exercises is sufficient for every patient with chronic knee problems Q4.10 It is important that people with chronic knee pain increase their overall activity levels Q4.11 How well a patient complies with their exercise programme determines how effective it will be Q4.20 Exercise for chronic knee pain should preferably be used after drug treatment has been tried
	Knowledge and attitudes about the efficacy of exercise	Q4.3 Knee problems are improved by quadriceps strengthening exercises Q4.4 Knee problems are improved by general exercise, for example walking or swimming Q4.16 Increasing the strength of the muscles around the knee stops the knee problems getting worse Q4.17 Increasing overall activity levels stops the knee problem getting worse
	Factors that may be perceived to influence efficacy of exercise	Q3.1The patient's symptoms are (very) severe, moderate, (very) mild Q3.2 It is most likely that this patient's symptoms result from knee damage that is (very) severe, moderate, (very) mild Q3.3 What investigations will you do/order for the patient at this point? Q3.5 What diagnosis would you give to the patient at this point? Q3.6 Using the words you would use with the patient, briefly state how you would describe your diagnosis to the patient Q3.7 Using the words you would use with the patient briefly describe what the future is likely to hold with regards to her knee problem Q2.1-2.10 Possible causes of CKP Q4.14 Exercise is effective for patients if an x-ray shows severe knee osteoarthritis Q4.15 Exercise works just as well for everybody, regardless of the amount of pain they have
	Knowledge and attitudes about risks/safety of exercises	Q4.5 Quadriceps strengthening exercises for the knee are safe for everybody to do Q4.6 General exercise, for example walking or swimming is safe for everybody to do Q2.15-2.33 adapted PABS_PT items
Social influences	Q5.8 We are interested to hear about your experiences of implementing guidelines in the management of chronic knee pain in the GP setting. Please describe any guidelines you find particularly helpful or relevant positive experiences, concerns about, barriers to use or memorable events regarding using guidelines for managing chronic knee pain.	

Moral norm	Q4.1 GPs should prescribe quadriceps strengthening exercises to every patient with chronic knee pain Q4.2 GPs should prescribe general exercise, for example, walking or swimming, for every patient with chronic knee pain	
Role and identity	Q2.11 It is part of a GP's job to manage people with chronic knee pain Q4.9 GPs should educate chronic knee pain patients about how to change their lifestyle for the better Q4.12 GPs should follow-up patients to monitor extent of continuation of exercises Q4.13 It is the patient's own responsibility to continue doing their exercise programme Q4.22 What do you feel is your role as a GP in exercise as a treatment for CKP?	
Characteristics of healthcare professional	Q1.1 Please state the year in which you qualified as a General Practitioner Q1.2 How many GPs work in your practice? Q1.3 How do you best describe yourself? (GP partner, salaried GP, locum GP, GP trainer, Other) Q1.4 Is your practice urban? Semi-rural? Rural? Q1.5 Are you male? Female? Q1.6 Are you a GP with a special interest in musculoskeletal conditions? Q1.7 Do you remember receiving any specific undergraduate training in the field of CKP? Q1.8 Do you remember receiving any specific postgraduate training in the field of CKP? Q1.9 Do you have, or have you ever suffered from chronic knee pain yourself?	
Beliefs about capabilities	Service-related factors	Q2.12 GPs have enough time to manage patients with CKP Q4.19 Time constraints prevent GPs from providing advice on individual exercises for chronic knee pain Q4.21 Exercise for CKP would be used more frequently if access to physiotherapy was easier
	Enquiry for GP- and patient-related factors	Q5.8 We are interested to hear about you experiences of implementing guidelines in the management of chronic knee pain in the GP setting. Please describe any guidelines you find particularly helpful or relevant positive experiences, concerns about, barriers to use or memorable events regarding using guidelines for managing chronic knee pain. Q4.18 Exercise for CKP is only effectively provided by physiotherapists
Intention	Motivation and goals	Q2.13 Managing patients with CKP is a priority for GPs Q2.14 Managing patients with CKP is of clinical interest to me
	Agreement with guideline	Q5.2 NICE is a credible source of guidance Q5.3 NICE guidelines are primarily targeted at GPs Q5.4 NICE guidelines are primarily targeted at secondary care Q5.5 NICE guidelines are primarily targeted at allied health professionals Q5.6 NICE guidelines are easily implemented in real-life situations Q5.7 NICE guidelines improve my management of patients

Habit/past behaviour		Q5.8 We are interested to hear about you experiences of implementing guidelines in the management of chronic knee pain in the GP setting. Please describe any guidelines you find particularly helpful or relevant positive experiences, concerns about, barriers to use or memorable events regarding using guidelines for managing chronic knee pain.
Behaviour		Q3.4 Would you refer this patient to someone at this point? [If yes, to whom would you refer her] Q3.8 At this consultation, what approaches would you use, or suggest, to manage this patient? Q3.9 Do you usually provide written information for patients in this situation? Q3.10 Would you offer any other advice as part of your treatment? Q3.11 What kind of exercise would you suggest to this patient at this stage? Q3.12 Using the words you would use with the patient, briefly state what advice you would give regarding exercise at this stage Q3.13 Would you check if this patient was completing her exercise programme? [If yes, please specify how you would do this]

Appendix 7: Pre-pilot questionnaire

PILOT QUESTIONNAIRE

We are preparing to undertake a study that will seek the views of general practitioners who treat patients over 45 years old, with chronic knee pain.

As this is a pilot of the questionnaire we would like you to first complete the main body of the questionnaire. After you have done this please complete the feedback questions at the end. We would like to know your views regarding the positive and negative aspects of this questionnaire. Please feel free to write additional comments where necessary.

Once you have completed your questionnaire please return it to Elizabeth Cottrell via her pigeon hole at the Arthritis Research Campaign National Primary Care Centre.

Instructions for completing this questionnaire

- ✓ When completing the questionnaire, please try and be as honest as possible throughout. There are no 'correct' or 'incorrect' answers.
- ✓ Where relevant please answer questions by ticking a box e.g. ☑
- ✓ We are interested in your clinical opinion about patients **aged 45 years and over** with **chronic knee pain**.
- ✓ Answer all questions using the definition of chronic knee pain as follows: knee pain and associated symptoms that have been present for more than 3 months and does not result from a fracture, infection, systemic rheumatological problem, metastases or surgery.
- ✓ Please do not consult any literature while completing this questionnaire.

Thank you for your help with this pilot study

Section 1: About you

1.1 Please state the year in which you qualified as a General Practitioner

1.2 How many General Practitioners work in your practice (including yourself)?

1.3 Is your practice ☐ Urban? ☐ Rural? ☐ Semi-rural?

1.4 Are you ☐ Male? ☐ Female?

1.5 How many patients aged 45 and over, with chronic knee pain, do you usually see?

☐ Less than one patient a month ☐ At least one patient a month ☐ At least one patient a week

1.6 Are you a GP with a special interest (GPwSI) in musculoskeletal disease, rheumatology or orthopaedics? ☐ Yes ☐ No

1.7 During your undergraduate training did you ever work in any of the following specialties? (tick as many as apply and state duration of post(s))

☐ Rheumatology	☐ Orthopaedics	☐ Rehabilitation
(Length of experience)	(Length of experience)	(Length of experience)
_____	_____	_____

1.8 Since graduation from medical school have you ever worked in any of the following specialties? (tick as many as apply and state length of time)

☐ Rheumatology	☐ Orthopaedics	☐ Rehabilitation
(Length of experience)	(Length of experience)	(Length of experience)
_____	_____	_____

1.9 Have you received any specific postgraduate training in the field of chronic knee pain?

☐ No ☐ Yes

If yes, please give details:

1.10 Do you have, or have you ever suffered from, knee pain yourself?

☐ No ☐ Yes

Section 2: Your views about chronic knee pain

Below is a list of **possible causes** of chronic knee pain. Please indicate the extent to which you agree or disagree with these causes by putting a tick in one box for each row.

		Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
2.1	Hereditary/runs in the family					
2.2	Being overweight/obese					
2.3	A person's own mental attitude e.g. thinking about life negatively					
2.4	A person's emotional state e.g. feeling down, anxious					
2.5	Ageing					
2.6	Accident or injury					
2.7	Chance or bad luck					
2.8	A person's own behaviour					
2.9	Work					
2.10	Sport					
2.11	Osteoarthritis					
2.12	Changes seen on x-ray					

When completing the following questions, please consider patients with **chronic knee pain over 45 years old**. Please indicate the extent to which you agree or disagree with the statements given by ticking one box per row.

		Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
2.13	Mental stress can cause chronic knee problems even in the absence of tissue damage					
2.14	The cause of chronic knee problems is unknown					
2.15	Pain is a nociceptive stimulus, indicating tissue damage					
2.16	A patient suffering from a severe chronic knee problem will benefit from physical exercise					
2.17	Functional limitations associated with chronic knee problem are the result of psychosocial factors					
2.18	Patients with chronic knee pain should preferably practise only pain free movements					
2.19	Therapy may have been successful even if pain remains					
2.20	Chronic knee pain indicates the presence of organic injury					
2.21	If chronic knee pain increases in severity, I immediately adjust the intensity of my treatment accordingly					
2.22	If therapy does not result in a reduction in chronic knee pain, there is a high risk of severe restrictions in the long term					
2.23	Pain reduction is a precondition for the restoration of normal functioning					
2.24	Increased pain indicates new tissue damage or the spread of existing damage					
2.25	There is no effective treatment to eliminate chronic knee pain					
2.26	Even if the pain has worsened, the intensity of the next treatment can be increased					
2.27	If a patient complains of pain during exercise, I worry that damage is being caused					
2.28	The severity of tissue damage determines the level of pain					
2.29	Learning to cope with stress promotes recovery from chronic knee problems					
2.30	Exercises that may be knee straining should not be avoided					
2.31	In the long run, patients with chronic knee problems have a higher risk of developing severe functional impairments					

Section 3: Clinical scenario of a patient with chronic knee pain

Presented below is a clinical scenario of a patient **with chronic knee pain** that presents to you with this problem for the first time. All questions that follow relate to the care you would give this particular patient. Think about the patient's first consultation with you.

Patient: Mrs Jones, 58-year-old Prison Officer

History: First presentation of gradually worsening bilateral knee pain (right worse than left) over 2 years
No history of trauma
Pain moderate when walking and at rest, worst when climbing stairs. No night pain.
Managing activities of daily living. Difficulty gardening.
Stopped going to gym – thinks was making pain worse
Only treatment tried is ibuprofen once or twice when pain "really bad" – no benefit.
Came today finding work increasingly difficult due to the stairs
Usually well – no comorbidities

Medication: Nil

Examination: Body Mass Index 33
Knees – bilaterally no effusions. Joint tenderness upon palpation. Bilateral coarse crepitations. Slightly reduced flexion of the right knee.

3.1 The patient's symptoms are: (please tick the **one** box that best reflects your opinion)

☐ Very severe ☐ Severe ☐ Moderate ☐ Mild ☐ Very mild

3.2 It is most likely that this patient's symptoms result from knee damage that is: (please tick the **one** box that best reflects your opinion)

☐ Very severe ☐ Severe ☐ Moderate ☐ Mild ☐ Very mild

3.3 What investigations will you do/order for this patient at this point? (please tick **all** that apply)

☐ Special imaging (e.g. CT, MRI, myelogram, bone scan) ☐ Lab test (e.g. inflammatory markers) ☐ Synovial fluid aspirate/analysis

☐ X-ray of the painful knee ☐ X-ray of other area ☐ None

☐ Other

If you ticked '**x-ray of other area**' or '**other**' please specify:

3.4 Would you refer this patient to see someone else at this point? ☐ Yes ☐ No

If yes, to whom would you refer her?

3.5 What diagnosis would you give to this patient at this point?

3.6 Using the words you would use with the patient, how would you describe your diagnosis to the patient?

3.7 Using the words you would use with the patient, briefly describe what the future is likely to hold with regards to her knee problem?

3.8 **At this point**, what approaches would you use or suggest to treat this patient? (please tick **all** that apply)

☐ Non-selective NSAIDs	☐ Paracetamol	☐ Opiates
☐ COX II inhibitor	☐ Anti-depressants	☐ Topical preparation (NSAIDs, capsaicin)
☐ Injection of hyaluronan	☐ Injection of steroids	☐ Provision of walking stick(s)
☐ Insoles	☐ Heat	☐ Ice
☐ Rest	☐ Bed rest	☐ Transcutaneous electrical nerve stimulation
☐ Exercise therapy	☐ Acupuncture	☐ Other

If you ticked **'other'** please specify

If you ticked "Exercise therapy" in question 3.8 please go on to answer question 3.9. If not, please move straight on to 3.12

3.9 What kind of exercise would you suggest to this patient at this stage?

3.10 Using the words you would use with the patient, what advice would you give regarding exercise at this stage?

3.11	Would you check if this patient was completing her exercise programme? If yes, please specify how would you do this?		Yes		No
3.12	Would you offer any other advice as part of your treatment If yes, please state the nature of your advice		Yes		No

Section 4: Your views about the role of exercise in treating chronic knee pain

We are interested in your views about the **role of exercise** in the treatment of **chronic knee pain in patients over 45 years old**. Please indicate the extent to which you agree or disagree with the statements given by putting a tick in one box per row.

		Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
4.1	GPs should prescribe quadriceps strengthening exercises to every patient with chronic knee pain					
4.2	GPs should prescribe general exercise, for example, walking or swimming, for every patient with chronic knee pain					
4.3	Knee problems are improved by quadriceps strengthening exercises					
4.4	Knee problems are improved by general exercise, for example walking or swimming					
4.5	Quadriceps strengthening exercises for the knee are safe for everybody to do					
4.6	General exercise, for example walking or swimming is safe for everybody to do					
4.7	Exercise for chronic knee pain is most beneficial when it is tailored to meet individual patient needs					
4.8	A standard set of exercises is sufficient for every patient with chronic knee problems					
4.9	GPs should educate chronic knee pain patients about how to change their lifestyle for the better					
4.10	It is important that people with chronic knee pain increase their overall activity levels					
4.11	How well a patient complies with their exercise programme determines how effective it will be					
4.12	It is the GP's responsibility to make sure the patient will continue doing their exercise programme					
4.13	It is the patient's own responsibility to continue doing their exercise programme					
4.14	Exercises are effective for patients if an x-ray shows mild knee osteoarthritis					
4.15	Exercises are effective for patients if an x-ray shows moderate knee osteoarthritis					
4.16	Exercises are effective for patients if an x-ray shows severe knee osteoarthritis					
4.17	Exercise works just as well for everybody, regardless of the amount of pain they have					
4.18	Increasing the strength of the muscles around the knee stops the knee problem getting worse					
4.19	Increasing overall activity levels stops the knee problem getting worse					
4.20	Exercise for chronic knee pain is only effectively provided by physiotherapists					
4.21	Time constraints prevent GPs from providing advice on individual exercises for chronic knee pain					
4.22	Exercise for chronic knee pain should only be used after drug treatment has been tried					
4.23	Exercise for chronic knee pain would be used more frequently if access to physiotherapy was easier					

4.35	What do you feel is your role as a GP in exercise for chronic knee pain?

Section 5: Awareness of guidelines

We are interested to know whether you are familiar with any of the following guidelines that address the management of chronic knee pain. Please indicate the degree to which you are familiar with the following guidelines by putting a tick in one box per row.

		I have never heard of them	I have heard of them but not seen them	Have seen them but not read them	Have read them	I use them to direct my practice
5.1	ACTION-K guidelines					
5.2	EULAR recommendations					
5.3	The MOVE consensus recommendations					
5.4	OARSI recommendations					
5.5	Osteoarthritis: NICE guideline					
5.6	Stepped model of care					

Pilot questionnaire feedback

As this is a pilot questionnaire we would be most grateful if you could please provide us with feedback about the questionnaire itself. Please feel free to use additional sheets if required.

FB1 How long did the questionnaire take to complete to this point?

FB2 Were there any questions that you felt could be omitted? (Please state question number and reason)

Question no.	Reason

FB3 Were there any questions that caused confusion? (Please state question number and reason)

Question no.	Reason

FB4 Were there any questions that have the potential to cause offence or irritation? (Please state question number and reason)

Question no.	Reason

FB5 Please use this space to provide feedback, comments or suggestions either about this study, using exercise to treat chronic knee pain in clinical practice, your own experience of using exercise for chronic knee pain and/or any other related topics.

You have reached the end of the questions. If you have any queries about this study, you can email Elizabeth Cottrell at e.cottrell@cphc.keele.ac.uk.

Thank you for taking the time to complete this questionnaire. Your time and participation is greatly appreciated.

Appendix 8: Questionnaire pre-pilot results

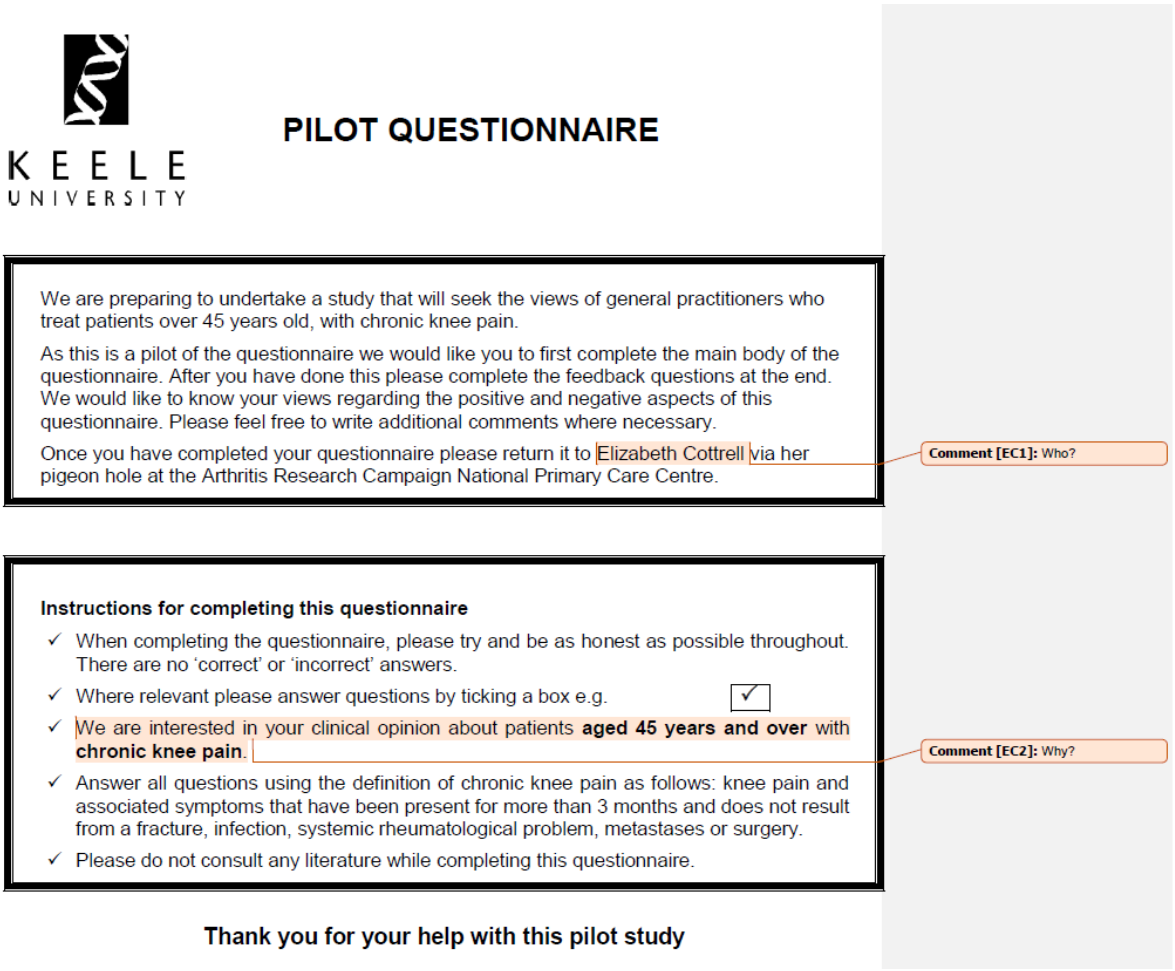
Table VIII-A Responses to pre-pilot questions

GP	How long did the questionnaire take to complete to this point?	Were there any questions you felt could be omitted?	Were there any questions that caused confusion?	Were there any questions that have the potential to cause offence or irritation?	Please use this space to provide feedback, comments or suggestions either about this study, using exercise to treat CKP in clinical practice, your own experience of using exercise for CKP and/or any other related topics
A	15 minutes but I thought too hard about some of the questions	Depends what the research question is - I haven't seen the participant information sheet	See comments next to the questions	No	
B	15 mins	2.7 ?if you need to take something out	2.30 Two negative statements		Seems good. Clinical scenario ?need to know hip examination *** *** no other if problems identified. I try and use exercise all the time but patients have different pre-conceptions about it. Motivation normally the biggest *** - pt not prepared to put the effort in
C	15 mins +	1.9 Don't know of many/any postgraduate courses on chronic knee pain	1.1 Sessional GPs/Academic GPs, 3.6, 3.7, 3.10 Using own words - language varies with type of patient	4.12 If the question was re-phrased - agree that GPs responsibility to provide information, ensure that take up is maintained, followed up etc. but "responsibility" and "will" does not equal patient centered care	N/A

D	I don't know you didn't ask me to time it	1.5 - see comment. 5.6 Very nice of you to put *** in but I am not sure it has high enough profile to be recognised	4.12 while agreeing that it may be theoretically true that it is a GPs responsibility I think the simpler question to ask "GP's should follow up patients to…"	1.5 - see comment.	Not enough room to write responses in 3.6, 2.7, 3.10 - I think I did not put down everything as not enough room. Also 2.21 did not understand the emphasis on "immediately"
E	15-20 minutes	3.5 or 3.6 They could be amalgamated. 3.9 or 3.10 could also perhaps be almalgamated both seem nearly to be the same	3.8 since you can tick more htan 1 do you mean at this consultation that you might consider or only the ones you would sugges and/or use on this occasion i.e. paracetamol or NSAIDs and exercise	Section 5 "I use them to direct my practice" - perhaps this should be "I consider them when planning management" "direct" is a little too black and white	It is a very "busy" questionnaire but I fully appreciate all the information you're trying to get at in as short space. It might put some practitioners off. I was quicker than the average as knees are something I think about a lot re my own research.
F	15 mins	Questions on intensity of treatment - relevant to physio maybe not GP			
G	10-20min	2.13-2.30 and 4.1 - 4.23 are often repetitive for too many GPs in a hurry, very little difference between questions, MUST be simplified daunting to see these long lists	2.13-2.30 and 4.1 - 4.23 are often repetitive for too many GPs in a hurry, very little difference between questions, MUST be simplified daunting to see these long lists	No	Very physio oriented. Is this being put out to the average GP or to those interested in teaching/research. The questionnaire will need to be tailored accordingly

H	20min	4.14-4.17 I think 4.17 on its own is probably sufficiently, although on second reading I think you are asking about severity of x-ray changes as well as pain with respect to exercise, Just felt a bit repetitive	2.26 No idea what meant by question, obviously one would aim to reduce pain if possible. 2.30 Negative phrasing requires a bit of thought so you might get GPs ticking the wrong box	No	I have an MSc in Sports and Exercise medicine so I am quite comfortable with advising patients about exercise. Most GPs are unsure what to advice, worried that things may go "wrong" and strapped for time. I would like to see more help for GPs about how to do things in practice, rather than guidelines that preach but don't explain. It would be great if this study could address this
CKP = chronic knee pain; GP = general practitioner					

Figure VIII-A Pre-pilot questionnaire annotated with GPs' feedback



KEELE UNIVERSITY

PILOT QUESTIONNAIRE

We are preparing to undertake a study that will seek the views of general practitioners who treat patients over 45 years old, with chronic knee pain.

As this is a pilot of the questionnaire we would like you to first complete the main body of the questionnaire. After you have done this please complete the feedback questions at the end. We would like to know your views regarding the positive and negative aspects of this questionnaire. Please feel free to write additional comments where necessary.

Once you have completed your questionnaire please return it to Elizabeth Cottrell via her pigeon hole at the Arthritis Research Campaign National Primary Care Centre.

Comment [EC1]: Who?

Instructions for completing this questionnaire

- ✓ When completing the questionnaire, please try and be as honest as possible throughout. There are no 'correct' or 'incorrect' answers.
- ✓ Where relevant please answer questions by ticking a box e.g. ☑
- ✓ We are interested in your clinical opinion about patients **aged 45 years and over** with **chronic knee pain**.
- ✓ Answer all questions using the definition of chronic knee pain as follows: knee pain and associated symptoms that have been present for more than 3 months and does not result from a fracture, infection, systemic rheumatological problem, metastases or surgery.
- ✓ Please do not consult any literature while completing this questionnaire.

Comment [EC2]: Why?

Thank you for your help with this pilot study

Section 1: About you

1.1 Please state the year in which you qualified as a General Practitioner

1.2 How many General Practitioners work in your practice (including yourself)?

1.3 Is your practice ☐ Urban? ☐ Rural? ☐ Semi-rural?

1.4 Are you ☐ Male? ☐ Female?

1.5 How many patients aged 45 and over, with chronic knee pain, do you usually see?

☐ Less than one patient a month ☐ At least one patient a month ☐ At least one patient a week

1.6 Are you a GP with a special interest (GPwSI) in musculoskeletal disease, rheumatology or orthopaedics? ☐ Yes ☐ No

1.7 During your undergraduate training did you ever work in any of the following specialties? (tick as many as apply and state duration of post(s))

☐ Rheumatology	☐ Orthopaedics	☐ Rehabilitation
(Length of experience)	(Length of experience)	(Length of experience)
_____	_____	_____

1.8 Since graduation from medical school have you ever worked in any of the following specialties? (tick as many as apply and state length of time)

☐ Rheumatology	☐ Orthopaedics	☐ Rehabilitation
(Length of experience)	(Length of experience)	(Length of experience)
_____	_____	_____

1.9 Have you received any specific postgraduate training in the field of chronic knee pain?

☐ No ☐ Yes

If yes, please give details:

1.10 Do you have, or have you ever suffered from, knee pain yourself?

☐ No ☐ Yes

Comment [EC3]: ?Need to add a section for sessional GPs/academic GPs

Comment [EC4]: I hate these questions - its what drug companies always want to know and I find it difficult to answer as don't like giving guestimates

Comment [EC5]: Need a none box or ?missing data

Comment [EC6]: Do you mean train (were attached to)?

Comment [EC7]: Need a none box or ?missing data (suggested by 2 people)

Comment [EC8]: Difficult question - how can I remember over the past 22 years? I'm sure I must have attended a course/lecture which dealt with this at some stage

Comment [EC9]: Dont know of any/many postgraduate courses on chronic knee pain

Comment [EC10]: Who hasn't

Section 2: Your views about chronic knee pain

Comment [EC11]: I would like a dont know option for these 2 sections

Below is a list of **possible causes** of chronic knee pain. Please indicate the extent to which you agree or disagree with these causes by putting a tick in one box for each row.

Comment [EC12]: What about "conditions that predispose"

		Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
2.1	Hereditary/runs in the family					
2.2	Being overweight/obese					
2.3	A person's own mental attitude e.g. thinking about life negatively					
2.4	A person's emotional state e.g. feeling down, anxious					
2.5	Ageing					
2.6	Accident or injury					
2.7	Chance or bad luck					
2.8	A person's own behaviour					
2.9	Work					
2.10	Sport					
2.11	Osteoarthritis					
2.12	Changes seen on x-ray					

Comment [EC13]: ?If you need to take something out

Comment [EC14]: Depends what sort of work

Comment [EC15]: Depends on severity re extent of my agreement

Comment [P & E16]: Not sure I understand

When completing the following questions, please consider patients with **chronic knee pain over 45 years old**. Please indicate the extent to which you agree or disagree with the statements given by ticking one box per row.

		Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
2.13	Mental stress can cause chronic knee problems even in the absence of tissue damage					
2.14	The cause of chronic knee problems is unknown					
2.15	Pain is a nociceptive stimulus, indicating tissue damage					
2.16	A patient suffering from a severe chronic knee problem will benefit from physical exercise					
2.17	Functional limitations associated with chronic knee problem are the result of psychosocial factors					
2.18	Patients with chronic knee pain should preferably practise only pain free movements					
2.19	Therapy may have been successful even if pain remains					
2.20	Chronic knee pain indicates the presence of organic injury					
2.21	If chronic knee pain increases in severity, I immediately adjust the intensity of my treatment accordingly					
2.22	If therapy does not result in a reduction in chronic knee pain, there is a high risk of severe restrictions in the long term					
2.23	Pain reduction is a precondition for the restoration of normal functioning					
2.24	Increased pain indicates new tissue damage or the spread of existing damage					
2.25	There is no effective treatment to eliminate chronic knee pain					
2.26	Even if the pain has worsened, the intensity of the next treatment can be increased					
2.27	If a patient complains of pain during exercise, I worry that damage is being caused					
2.28	The severity of tissue damage determines the level of pain					
2.29	Learning to cope with stress promotes recovery from chronic knee problems					
2.30	Exercises that may be knee straining should not be avoided					
2.31	In the long run, patients with chronic knee problems have a higher risk of developing severe functional impairments					

Comment [EC17]: ?type

Comment [EC18]: why add this? Did not understand the emphasis on "immediately"

Comment [P & E19]: Questions on intensity of treatment - relevant to physio maybe not GP

Comment [P & E20]: 2.26 No idea what meant by question, obviously one would aim to reduce pain if possible

Comment [P & E21]: Not Sure what this means

Comment [EC22]: Two negative statements

Comment [EC23]: Quite difficult to understand

Comment [P & E24]: 2.30 Negative phrasing requires a bit of thought so you might get GPs ticking the wrong box

Comment [P & E25]: are often repetative for too many GPs in a hurry, very little difference between questions, MUST be simplified daunting to see these long lists

Section 3: Clinical scenario of a patient with chronic knee pain

Presented below is a clinical scenario of a patient **with chronic knee pain** that presents to you with this problem for the first time. All questions that follow relate to the care you would give this particular patient. Think about the patient's first consultation with you.

Patient: Mrs Jones, 58-year-old Prison Officer

History: First presentation of gradually worsening bilateral knee pain (right worse than left) over 2 years
No history of trauma
Pain moderate when walking and at rest, worst when climbing stairs. No night pain.
Managing activities of daily living. Difficulty gardening.
Stopped going to gym – thinks was making pain worse
Only treatment tried is ibuprofen once or twice when pain "really bad" – no benefit.
Came today finding work increasingly difficult due to the stairs
Usually well – no comorbidities

Medication: Nil

Examination: Body Mass Index 33
Knees – bilaterally no effusions. Joint tenderness upon palpation. Bilateral coarse crepitations.
Slightly reduced flexion of the right knee.

3.1 The patient's symptoms are: (please tick the **one** box that best reflects your opinion)

☐ Very severe ☐ Severe ☐ Moderate ☐ Mild ☐ Very mild

3.2 It is most likely that this patient's symptoms result from knee damage that is: (please tick the **one** box that best reflects your opinion)

☐ Very severe ☐ Severe ☐ Moderate ☐ Mild ☐ Very mild

3.3 What investigations will you do/order for this patient at this point? (please tick **all** that apply)

☐ Special imaging (e.g. CT, MRI, myelogram, bone scan) ☐ Lab test (e.g. inflammatory markers) ☐ Synovial fluid aspirate/analysis

☐ X-ray of the painful knee ☐ X-ray of other area ☐ None

☐ Other

If you ticked '**x-ray of other area**' or '**other**' please specify:

3.4 Would you refer this patient to see someone else at this point? ☐ Yes ☐ No

If yes, to whom would you refer her?

3.5 What diagnosis would you give to this patient at this point?

3.6 Using the words you would use with the patient, how would you describe your diagnosis to the patient?

Comment [EC26]: Does this give the answer to 3.1 [NB Womac Score 20]

Comment [EC27]: Should this be knees or knee - one person commented that they would do both knees

Comment [EC28]: One person commented that they would do hips if examination of hips abnormal - they commented that hip examination was not mentioned

Comment [EC29]: 3.5 or 3.6 They could be amalgamated.

Comment [EC30]: Not enough room to write responses

Comment [EC31]: Really difficult to answer this question - depends on the patient - the language and information style that you would use

3.7 Using the words you would use with the patient, briefly describe what the future is likely to hold with regards to her knee problem?

Comment [EC32]: Not enough room to write responses

Comment [EC33]: Really difficult to answer this question - depends on the patient - the language and information style that you would use

3.8 **At this point**, what approaches would you use or suggest to treat this patient? (please tick **all** that apply)

☐ Non-selective NSAIDs	☐ Paracetamol	☐ Opiates
☐ COX II inhibitor	☐ Anti-depressants	☐ Topical preparation (NSAIDs, capsaicin)
☐ Injection of hyaluronan	☐ Injection of steroids	☐ Provision of walking stick(s)
☐ Insoles	☐ Heat	☐ Ice
☐ Rest	☐ Bed rest	☐ Transcutaneous electrical nerve stimulation
☐ Exercise therapy	☐ Acupuncture	☐ Other

If you ticked '**other**' please specify

Comment [EC34]: One person did not tick exercise therapy at this stage and then went on to describe advice they would give to exercise in question 3.12

Comment [EC35]: 3.8 since you can tick more than 1 do you mean at this consultation that you might consider or only the ones you would sugges and/or use on this occasion i.e. paracetamol or NSAIDs and exercise

Comment [EC36]: and consider in the treatment of this patient

Comment [EC37]: At least 2 people did not tick this box but went on to talk about exercise

If you ticked "Exercise therapy" in question 3.8 please go on to answer question 3.9. If not, please move straight on to 3.12

3.9 What kind of exercise would you suggest to this patient at this stage?

Comment [EC38]: 3.9 or 3.10 could also perhaps be almalgamated both seem nearly to be the same

3.10 Using the words you would use with the patient, what advice would you give regarding exercise at this stage?

Comment [EC39]: Not enough room to write responses

Comment [EC40]: Really difficult to answer this question - depends on the patient - the language and information style that you would use

3.11 Would you check if this patient was completing her exercise programme? ☐ Yes ☐ No

If yes, please specify how would you do this?

3.12 Would you offer any other advice as part of your treatment ☐ Yes ☐ No

If yes, please state the nature of your advice

Section 4: Your views about the role of exercise in treating chronic knee pain

We are interested in your views about the **role of exercise** in the treatment of **chronic knee pain in patients over 45 years old**. Please indicate the extent to which you agree or disagree with the statements given by putting a tick in one box per row.

		Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
4.1	GPs should prescribe quadriceps strengthening exercises to every patient with chronic knee pain					
4.2	GPs should prescribe general exercise, for example, walking or swimming, for every patient with chronic knee pain					
4.3	Knee problems are improved by quadriceps strengthening exercises					
4.4	Knee problems are improved by general exercise, for example walking or swimming					
4.5	Quadriceps strengthening exercises for the knee are safe for everybody to do					
4.6	General exercise, for example walking or swimming is safe for everybody to do					
4.7	Exercise for chronic knee pain is most beneficial when it is tailored to meet individual patient needs					
4.8	A standard set of exercises is sufficient for every patient with chronic knee problems					
4.9	GPs should educate chronic knee pain patients about how to change their lifestyle for the better					
4.10	It is important that people with chronic knee pain increase their overall activity levels					
4.11	How well a patient complies with their exercise programme determines how effective it will be					
4.12	It is the GP's responsibility to make sure the patient will continue doing their exercise programme					
4.13	It is the patient's own responsibility to continue doing their exercise programme					
4.14	Exercises are effective for patients if an x-ray shows mild knee osteoarthritis					
4.15	Exercises are effective for patients if an x-ray shows moderate knee osteoarthritis					
4.16	Exercises are effective for patients if an x-ray shows severe knee osteoarthritis					
4.17	Exercise works just as well for everybody, regardless of the amount of pain they have					
4.18	Increasing the strength of the muscles around the knee stops the knee problem getting worse					
4.19	Increasing overall activity levels stops the knee problem getting worse					
4.20	Exercise for chronic knee pain is only effectively provided by physiotherapists					
4.21	Time constraints prevent GPs from providing advice on individual exercises for chronic knee pain					
4.22	Exercise for chronic knee pain should only be used after drug treatment has been tried					
4.23	Exercise for chronic knee pain would be used more frequently if access to physiotherapy was easier					

Comment [EC41]: Or most?

Comment [P & E42]: More Or less - qualify

Comment [EC43]: 4.12 while agreeing that it may be theoretically true that it is a GPs responsibility I think the simpler question to ask "GP's should follow up patients to…"

Comment [EC44]: If the question was re-phrased - agree that GPs responsibility to provide information, ensure that take up is maintained, followed up etc but "responsibility" and "will" does not equal patient centered care

Comment [P & E45]: 4.14-4.17 I think 4.17 on its own is probably sufficienty, although on second reading I think you areasking about severity of x-ray changes as well as pain with respect to exercise, Just felt a bit repetative

4.35 What do you feel is your role as a GP in exercise for chronic knee pain?

Comment [EC46]: Renumber

Comment [P & E47]: are often repetative for too many GPs in a hurry, very little difference between questions, MUST be simplified daunting to see these long lists

Section 5: Awareness of guidelines

We are interested to know whether you are familiar with any of the following guidelines that address the management of chronic knee pain. Please indicate the degree to which you are familiar with the following guidelines by putting a tick in one box per row.

		I have never heard of them	I have heard of them but not seen them	Have seen them but not read them	Have read them	I use them to direct my practice
5.1	ACTION-K guidelines					
5.2	EULAR recommendations					
5.3	The MOVE consensus recommendations					
5.4	OARSI recommendations					
5.5	Osteoarthritis: NICE guideline					
5.6	Stepped model of care					

Comment [EC48]: Not the whole document just the summary

Comment [EC49]: Section 5 "I use them to direct my practice" - perhaps this should be "I consider them when planning management" "direct" is a little too black and white

Comment [EC50]: I'm only allowed one tick but I have done both [read them and use them to direct practice]

Appendix 9: Standard pilot questionnaire

Keele University

Unique survey ID	

Management of Chronic Knee Pain Study

We are seeking the views of general practitioners who treat patients over 45 years old, with chronic knee pain.

If you **have not** managed someone with chronic knee pain in the last 6 months, please tick this box and return the questionnaire without completing it any further. ☐

If you **are not** a general practitioner, please tick this box and return the questionnaire without completing it any further ☐

This questionnaire should take no more than **15 minutes** to complete.

Return of your completed questionnaire will be interpreted as you providing your consent to participate in this study.

Once you have completed your questionnaire please return it to Dr Elizabeth Cottrell, Academic Clinical Fellow GP Specialty Trainee, at the Arthritis Research UK Primary Care Centre, Keele University, Staffordshire, ST5 5BG using the enclosed FREEPOST envelope.

If you have any questions about this questionnaire or the study in general you can email Elizabeth Cottrell at e.cottrell@cphc.keele.ac.uk

Instructions for completing this questionnaire

- ✓ When completing the questionnaire, please try and be as honest as possible throughout. There are no 'correct' or 'incorrect' answers.
- ✓ Where relevant please answer questions by ticking a box e.g. ☑
- ✓ We are interested in your clinical opinion about patients **aged 45 years and over** with **chronic knee pain**. In this age group chronic knee pain is synonymous with knee osteoarthritis.
- ✓ Answer all questions using the definition of chronic knee pain as follows: knee pain and associated symptoms that have been present for more than 3 months and does not result from a fracture, infection, systemic rheumatological problem, metastases or surgery.
- ✓ Please do not consult any literature while completing this questionnaire.
- ✓ If you wish to enter the prize draw to win £100 worth of Amazon vouchers, please complete your details at the back of the questionnaire.

Thank you for your help with this study

REC Number: XX/XXXXX/XX

Version number, Date:

Section 1: About you

1.1 Please state the year in which you qualified as a General Practitioner ☐

1.2 How many General Practitioners work in your practice (including yourself)? ☐

1.3 How do you best **describe yourself** (please tick **one box** only)

☐ GP Partner ☐ Salaried GP ☐ Locum GP

☐ GP trainer ☐ Other

If you ticked '**other**', please specify

1.4 Is your practice ☐ Urban? ☐ Semi-rural? ☐ Rural?

1.5 Are you ☐ Male? ☐ Female?

1.6 Are you a **GP with a special interest (GPwSI)** in musculoskeletal conditions?

☐ No ☐ Yes

1.7 Do you remember receiving any **specific undergraduate training** in the field of chronic knee pain?

☐ No ☐ Yes ☐ Don't know or cannot remember

If yes, please give details:

1.8 Do you remember receiving any **specific postgraduate training** in the field of chronic knee pain?

☐ No ☐ Yes ☐ Don't know or cannot remember

If yes, please give details:

1.9 Do you have, or have you ever suffered from chronic knee pain **yourself**?

☐ No ☐ Yes

Section 2: Your views about chronic knee pain

Below is a list of **possible causes** for a patient developing chronic knee pain. Please indicate the extent to which you agree or disagree with these causes by ticking one box in each row.

		Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
2.1	Hereditary/runs in the family					
2.2	Being overweight/obese					
2.3	A person's own mental attitude e.g. thinking about life negatively					
2.4	A person's emotional state e.g. feeling down, anxious					
2.5	Ageing					
2.6	Accident or injury					
2.7	Manual work					
2.8	Sport					
2.9	Osteoarthritis					
2.10	Changes consistent with osteoarthritis seen on x-ray					

Please consider the **GPs role** in managing patients aged over 45 years old with chronic knee pain. Please indicate the extent to which you agree or disagree with the statements given by ticking one box per row.

		Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
2.11	It is part of a GP's job to manage people with chronic knee pain					
2.12	GPs have enough time to manage patients with chronic knee pain					
2.13	Managing patients with chronic knee pain is a priority for GPs					
2.14	Managing patients with chronic knee pain is of clinical interest to me					

When completing the following questions, please consider patients aged over 45 years old with **chronic knee pain**. Please indicate the extent to which you agree or disagree with the statements given by ticking one box per row.

		Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
2.15	Mental stress can cause chronic knee problems even in the absence of tissue damage					
2.16	The cause of chronic knee problems is unknown					
2.17	Pain is a nociceptive stimulus, indicating tissue damage					
2.18	A patient suffering from a severe chronic knee problem will benefit from physical exercise					
2.19	Functional limitations associated with chronic knee problems are the result of psychosocial factors					
2.20	Patients with chronic knee pain should preferably practise only pain free movements					
2.21	Therapy may have been successful even if pain remains					
2.22	Chronic knee pain indicates the presence of organic injury					
2.23	If chronic knee pain increases in severity, I immediately adjust the intensity of my treatment accordingly					
2.24	If therapy does not result in a reduction in chronic knee pain, there is a high risk of severe restrictions in the long term					
2.25	Pain reduction is a precondition for the restoration of normal functioning					
2.26	Increased pain indicates new tissue damage or the spread of existing damage					
2.27	There is no effective treatment to eliminate chronic knee problems					
2.28	Even if the pain has worsened, the intensity of the next treatment can be increased					
2.29	If patients complain of pain during exercise, I worry that damage is being caused					
2.30	The severity of tissue damage determines the level of pain					
2.31	Learning to cope with stress promotes recovery from chronic knee problems					
2.32	Exercises that may be knee straining should not be avoided					
2.33	In the long run, patients with chronic knee pain have a higher risk of developing severe functional impairments					

Section 3: Clinical scenario of a patient with chronic knee pain

Presented below is a clinical scenario of a patient **with chronic knee pain** that presents to you with this problem for the first time. All questions that follow relate to the care you would give this particular patient. Think about the patient's first consultation with you.

Patient: Mrs Jones, 58-year-old Prison Officer

History: First presentation of gradually worsening bilateral knee pain (right worse than left) over 2 years
No history of trauma
Pain always present when walking and at rest, worst when climbing stairs. No night pain.
Managing activities of daily living. Difficulty gardening.
Stopped going to gym – thinks was making pain worse
Only treatment tried is ibuprofen once or twice when pain "really bad" – no benefit.
Came today finding work increasingly difficult due to the stairs
Usually well – no comorbidities

Medication: Nil

Examination: Body Mass Index 33
Knees – bilaterally no effusions. Joint tenderness upon palpation. Bilateral coarse crepitations.
Slightly reduced flexion of the right knee.
Hips – no abnormality detected

3.1 The patient's **symptoms** are: (please tick the **one** box that best reflects your opinion)

☐ Very severe ☐ Severe ☐ Moderate ☐ Mild ☐ Very mild

3.2 It is most likely that this patient's symptoms result from **knee damage** that is: (please tick the **one** box that best reflects your opinion)

☐ Very severe ☐ Severe ☐ Moderate ☐ Mild ☐ Very mild

3.3 What **investigations** will you do/order for this patient at this point? (please tick **all** that apply)

☐ None
☐ Lab test (e.g. inflammatory markers)
☐ Special imaging (e.g. CT, MRI, myelogram, bone scan)
☐ Knee x-ray
☐ X-ray of other area
☐ Synovial fluid aspirate/analysis
☐ Other

If you ticked '**x-ray of other area'** or **'other'** please specify:

_____

3.4 Would you **refer** this patient to see someone else at this point? ☐ Yes ☐ No

If yes, to whom would you refer her?

_____

_____

3.5 What **diagnosis** would you give to this patient at this point?

_____

3.6 Using the words you would use with the patient, ***briefly*** state how you would **describe your diagnosis** to the patient?

_____

_____

3.7 Using the words you would use with the patient, ***briefly*** describe **what the future is likely to hold** with regards to her knee problem?

_____

3.8 **At this consultation**, what approaches would you use or suggest to manage this patient? (please tick **all** that apply)

☐ Non-selective NSAIDs	☐ Paracetamol	☐ Opiates
☐ COX II inhibitor	☐ Anti-depressants	☐ Topical NSAID preparation
☐ Injection of hyaluronan	☐ Injection of steroids	☐ Topical capsaicin preparation
☐ Insoles	☐ Heat	☐ Transcutaneous electrical nerve stimulation
☐ Rest	☐ Bed rest	☐ Quadriceps strengthening exercises
☐ General exercise	☐ Ice	☐ Provision of walking stick(s)
☐ Acupuncture	☐ Other	☐ None

If you ticked **'other'** please specify

_____

3.9 Do you usually provide **written information** for patients in this situation? ☐ Yes ☐ No

If yes, please give details (e.g. name of and/or source of booklet/leaflet, website address)

_____

3.10 Would you offer any **other advice** as part of your treatment ☐ Yes ☐ No

If yes, please state the nature of your advice

_____

_____

If you ticked an answer involving "Exercise" in question 3.8 please go on to answer questions 3.11-3.13 below. If not, please move straight on to Section 4

3.11 What **kind of exercise** would you suggest to this patient at this stage?

_____

3.12 Using the words you would use with the patient, briefly state what **advice** you would give regarding exercise at this stage

_____

_____

3.13 Would you **check** if this patient was completing her exercise programme? ☐ Yes ☐ No

If yes, please specify how would you do this?

_____

_____

Section 4: Your views about the role of exercise in treating chronic knee pain

We are interested in your views about the **role of exercise** in the treatment of **chronic knee pain in patients over 45 years old**. Please indicate the extent to which you agree or disagree with the statements given by ticking one box per row.

		Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
4.1	GPs should prescribe quadriceps strengthening exercises to every patient with chronic knee pain					
4.2	GPs should prescribe general exercise, for example, walking or swimming, for every patient with chronic knee pain					
4.3	Knee problems are improved by quadriceps strengthening exercises					
4.4	Knee problems are improved by general exercise, for example walking or swimming					
4.5	Quadriceps strengthening exercises for the knee are safe for everybody to do					
4.6	General exercise, for example walking or swimming is safe for everybody to do					
4.7	Exercise for chronic knee pain is most beneficial when it is tailored to meet individual patient needs					
4.8	A standard set of exercises is sufficient for every patient with chronic knee problems					
4.9	GPs should educate chronic knee pain patients about how to change their lifestyle for the better					
4.10	It is important that people with chronic knee pain increase their overall activity levels					
4.11	How well a patient complies with their exercise programme determines how effective it will be					
4.12	GPs should follow up patients to monitor extent of continuation of exercises					
4.13	It is the patient's own responsibility to continue doing their exercise programme					
4.14	Exercise is effective for patients if an x-ray shows severe knee osteoarthritis					
4.15	Exercise works just as well for everybody, regardless of the amount of pain they have					
4.16	Increasing the strength of the muscles around the knee stops the knee problem getting worse					
4.17	Increasing overall activity levels stops the knee problem getting worse					
4.18	Exercise for chronic knee pain is only effectively provided by physiotherapists					
4.19	Time constraints prevent GPs from providing advice on individual exercises for chronic knee pain					
4.20	Exercise for chronic knee pain should only be used after drug treatment has been tried					
4.21	Exercise for chronic knee pain would be used more frequently if access to physiotherapy was easier					
4.22	What do you feel is your role as a GP in exercise as a treatment for chronic knee pain? _____ _____ _____ _____					

Section 5: Guidelines

Please indicate the degree to which you are familiar with the current **NICE guidelines**.

		I have never heard about or read them	I have heard of them but not seen them	I have seen them but not read them	I have read the full guidance and/or summary	I consider the guidance when planning management
5.1	How much have you heard or read about the guideline published by NICE in 2008 for the care and management of osteoarthritis in adults?					

We are interested to know how much you value **NICE guidelines** as a tool to inform your clinical practice. Please indicate the degree to which you agree with the following statements by ticking one box per row.

		Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
5.2	NICE is a credible source of guidance					
5.3	NICE guidelines are primarily targeted at GPs					
5.4	NICE guidelines are primarily targeted at secondary care					
5.5	NICE guidelines are primarily targeted at allied health professionals					
5.6	NICE guidelines are easily implemented in real-life situations					
5.7	NICE guidelines improve my management of patients					

5.8	We are interested to hear about **your experiences of implementing guidelines** in the management of chronic knee pain in the GP setting. Please describe any guidelines you find particularly helpful or relevant positive experiences, concerns about, barriers to use or memorable events regarding using guidelines for managing chronic knee pain _____ _____ _____ _____

Would you be happy for us to contact you again in the future regarding this study?

☐ Yes ☐ No

Would you like to be entered into the prize draw to win £100 worth of Amazon vouchers?

☐ Yes ☐ No

If you answered YES to either of the questions above please provide your name and contact details below (these details will be kept separately from your responses to the questionnaire):

Name:	
Daytime telephone number:	
Address:	
Email	

End of Questionnaire

You have reached the end of the questionnaire. Please return the questionnaire in the **FREEPOST** envelope provided.

If you have any questions about this questionnaire or the study in general, you can email Elizabeth Cottrell at e.cottrell@cphc.keele.ac.uk

Thank you for taking the time to complete this questionnaire. Your time and participation is greatly appreciated.

Unique survey ID

Appendix 10: Strengths and weaknesses of strategies that may improve response to questionnaire surveys

Method of improving questionnaire response	Further information	Strengths	Limitations
Target strategies at groups known to have poor response rate	Hand written letters, telephone calls, visiting practices (333)	Rather than using high levels of resources across whole sample and thus including those who would have responded anyway, target more intensive resource use at those known not to respond so well	Different recruitment methods across a sample could be criticised as samples recruited by each method may not be comparable Using telephone to complete questionnaire costs substantially more than a postal questionnaire
Incentives (257,342)	Particularly if provided with the questionnaire rather than on return (257,338) Particularly if monetary (257,291) Substantial prize more effective than multiple smaller prizes (343) Reimbursement of time spent may be more acceptable than incentives for GPs (252)	Reduces selection bias towards the more altruistic individuals (252)	May change the nature of respondents – those on lower incomes may be more incentivised (252) Increased cost for survey if incentives provided to every person mailed regardless of whether they respond or not
Sending the questionnaire by recorded delivery and by first class post (257)	A systematic review reported in 2007 supported the earlier finding that use of first class stamps on return envelopes improved responses (291)	If using recorded delivery one can be sure the questionnaire has arrived and not got lost	Costly – recorded delivery more so than first class but both more costly than other questionnaire delivery methods
Using stamped returned envelopes rather than business reply or franked envelopes (257,340)		Demonstrates a personal touch rather than a 'conveyer belt' approach	More labour intensive when preparing questionnaire packs
Short questionnaires (257)	Inconsistently defined: 1-2 sides of A4 – found to not reliably increase response rate but it can do (340) 32-part questionnaire too long for 3% GPs in one survey (287) Below 1000 words (341)	Shorter questionnaires will contain fewer items and thus less data to analyse, may be less daunting to the physicians receiving them and they will also be cheaper to print and post.	Quality of data may not be optimal if the questions removed for the sake of brevity may help to explain certain findings

Personalised cover letters (257,291,338)	Barclay et al describes using a hand written follow-up letter pleading for further responses to boost the power of the survey (333)	Respondents feel valued due to personalised nature of the contact	Administration is more labour intensive thus the survey will be more costly A handwritten note may not be feasible in a very large survey
Pre-contact letters (257,342)		Alerting GPs to imminent arrival of a questionnaire for a survey that they have been specifically selected for may prevent them from thinking that the questionnaire is a circular sent to all GPs	Increases burden on research administration staff and research costs May increase irritation of GPs who may feel 'bombarded' with mail
Follow-up contact and second copies (257)	This is generally beneficial for surveys overall (294), particularly of the general public, optimal number and timing of repeat mailings of GPs not known (333)	Serve as reminders for those GPs who have genuinely forgotten to complete or have lost the questionnaire	Increases burden on research administration staff and research costs May increase irritation of GPs who may feel 'bombarded' with mail

GPs = general practitioners

Appendix 11: Abbreviated pilot questionnaire

Unique survey ID	

Keele University

Management of Chronic Knee Pain Study

We are seeking the views of general practitioners who treat patients over 45 years old with chronic knee pain.

If you **have not** managed someone with chronic knee pain in the last 6 months, please tick this box and return the questionnaire without completing it any further. ☐

If you **are not** a general practitioner, please tick this box and return the questionnaire without completing it any further ☐

This questionnaire should take no more than **10 minutes** to complete.

Return of your completed questionnaire will be interpreted as you providing your consent to participate in this study.

Once you have completed your questionnaire please return it to Dr Elizabeth Cottrell, Academic Clinical Fellow GP Specialty Trainee, at the Arthritis Research UK Primary Care Centre, Keele University, Staffordshire, ST5 5BG using the enclosed FREEPOST envelope.

If you have any questions about this questionnaire or the study in general you can email Elizabeth Cottrell at e.cottrell@cphc.keele.ac.uk

Instructions for completing this questionnaire

- ✓ When completing the questionnaire, please try and be as honest as possible throughout. There are no 'correct' or 'incorrect' answers.
- ✓ Where relevant please answer questions by ticking a box e.g. ☑
- ✓ We are interested in your clinical opinion about patients **aged 45 years and over** with **chronic knee pain**. In this age group, chronic knee pain is synonymous with knee osteoarthritis.
- ✓ Answer all questions using the definition of chronic knee pain as follows: knee pain and associated symptoms that have been present for more than 3 months and does not result from a fracture, infection, systemic rheumatological problem, metastases or surgery.
- ✓ Please do not consult any literature while completing this questionnaire.

Thank you for your help with this study

REC Number: XX/XXXXX/XX

Version number, Date:

Section 1: About you

1.1	Please state the year in which you qualified as a General Practitioner						
1.2	How many General Practitioners work in your practice (including yourself)?						
1.3	Is your practice	☐	Urban?	☐	Semi-rural?	☐	Rural?
1.4	Are you	☐	Male?	☐	Female?		

We are interested in your familiarity with and views on **guidelines for chronic knee pain.** Please indicate the answer that best applies to you by ticking one box per row.

		I have never heard of them	I have heard of them but not seen them	I have seen them but not read them	I have read the full guidance and/or summary	I consider the guidance when planning management
1.5	How much have you heard or read about the guideline published by NICE in 2008 for the care and management of osteoarthritis in adults?					

		Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
1.6	NICE is a credible source of guidance					

Please consider the **GPs role** in managing patients aged over 45 years old with chronic knee pain. Please indicate the extent to which you agree or disagree with the statements given by ticking one box per row.

		Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
1.7	It is part of a GP's job to manage people with chronic knee pain					
1.8	GPs have enough time to manage patients with chronic knee pain					
1.9	Managing patients with chronic knee pain is a priority for GPs					
1.10	Managing patients with chronic knee pain is of clinical interest to me					

Section 2: Clinical scenario of a patient with chronic knee pain

Presented below is a clinical scenario of a patient **with chronic knee pain** that presents to you with this problem for the first time. All questions that follow relate to the care you would give this particular patient. Think about the patient's first consultation with you.

Patient: Mrs Jones, 58-year-old Prison Officer

History: First presentation of gradually worsening bilateral knee pain (right worse than left) over 2 years
No history of trauma
Pain always present when walking and at rest, worst when climbing stairs. No night pain.
Managing activities of daily living. Difficulty gardening.
Stopped going to gym – thinks was making pain worse
Only treatment tried is ibuprofen once or twice when pain "really bad" – no benefit.
Came today finding work increasingly difficult due to the stairs
Usually well – no comorbidities

Medication: Nil

Examination: Body Mass Index 33
Knees – bilaterally no effusions. Joint tenderness upon palpation. Bilateral coarse crepitations. Slightly reduced flexion of the right knee.
Hips – no abnormality detected

2.1 What (if any) **investigations** will you do/order for this patient at this point? (if none please write "**None**")

_____

_____

_____

2.2 Would you **refer** this patient to see someone else at this point? ☐ Yes ☐ No

If yes, to whom would you refer her?

_____

_____

_____

2.3 What **diagnosis** would you give to this patient at this point?

_____

2.4 **At this consultation**, what approaches would you use or suggest to manage this patient?

_____

_____

_____

_____

_____

Section 3: Your views about the role of exercise in treating chronic knee pain

We are interested in your views about the **role of exercise** in the treatment of **chronic knee pain in patients over 45 years old**. Please indicate the extent to which you agree or disagree with the statements given by ticking one box per row.

		Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
3.1	GPs should prescribe quadriceps strengthening exercises to every patient with chronic knee pain					
3.2	GPs should prescribe general exercise, for example, walking or swimming, for every patient with chronic knee pain					
3.3	Knee problems are improved by quadriceps strengthening exercises					
3.4	Knee problems are improved by general exercise, for example walking or swimming					
3.5	Quadriceps strengthening exercises for the knee are safe for everybody to do					
3.6	General exercise, for example walking or swimming is safe for everybody to do					
3.7	Exercise for chronic knee pain is most beneficial when it is tailored to meet individual patient needs					
3.8	A standard set of exercises is sufficient for every patient with chronic knee problems					
3.9	GPs should educate chronic knee pain patients about how to change their lifestyle for the better					
3.10	It is important that people with chronic knee pain increase their overall activity levels					
3.11	How well a patient complies with their exercise programme determines how effective it will be					
3.12	GPs should follow up patients to monitor extent of continuation of exercises					
3.13	It is the patient's own responsibility to continue doing their exercise programme					
3.14	Exercise is effective for patients if an x-ray shows severe knee osteoarthritis					
3.15	Exercise works just as well for everybody, regardless of the amount of pain they have					
3.16	Increasing the strength of the muscles around the knee stops the knee problem getting worse					
3.17	Increasing overall activity levels stops the knee problem getting worse					
3.18	Exercise for chronic knee pain is only effectively provided by physiotherapists					
3.19	Time constraints prevent GPs from providing advice on individual exercises for chronic knee pain					
3.20	Exercise for chronic knee pain should only be used after drug treatment has been tried					
3.21	Exercise for chronic knee pain would be used more frequently if access to physiotherapy was easier					

3.22	What do you feel is your role as a GP in exercise as a treatment for chronic knee pain? _____ _____ _____ _____

Would you be happy for us to contact you again in the future regarding this study?

☐ Yes ☐ No

If you answered YES to the question above please provide your name and contact details below (these details will be kept separately from your responses to the questionnaire):

Name:	
Daytime telephone number:	
Address:	
Email	

End of Questionnaire

You have reached the end of the questionnaire. Please return the questionnaire in the **FREEPOST** envelope provided.

If you have any questions about this questionnaire or the study in general, you can email Elizabeth Cottrell at e.cottrell@cphc.keele.ac.uk

Thank you for taking the time to complete this questionnaire. Your time and participation is greatly appreciated.

Unique survey ID

Appendix 12: Pilot study approvals

Figure XII-A Pilot study peer review approval

Elizabeth Cottrell <e.cottrell@keele.ac.uk>

Re: Peer Review Response

1 message

Claire Ashmore <c.ashmore@cphc.keele.ac.uk> 10 October 2011 12:50

To: Elizabeth Cottrell <e.cottrell@cphc.keele.ac.uk>

Cc: Ed Roddy <e.roddy@cphc.keele.ac.uk>, Nadine Foster <n.foster@cphc.keele.ac.uk>, Elaine Thomas <e.thomas@cphc.keele.ac.uk>, Mark Porcheret <m.porcheret@cphc.keele.ac.uk>

Hi Lizzie

Many thanks for your response. Just to inform you that Christian has now approved the protocol.

Best wishes
Claire

Claire Ashmore MA
Research Institute Manager for Primary Care & Health Sciences
Arthritis Research UK Primary Care Centre
Primary Care Sciences
Keele University
Keele, Staffordshire, ST5 5BG
Tel: 01782 734722
Fax: 01782 733911
E-mail: c.ashmore@cphc.keele.ac.uk

Figure XII-B Pilot study ethical approval

RESEARCH AND ENTERPRISE SERVICES

7 November 2011

Dr Elizabeth Cottrell
Arthritis Research UK Primary Care Centre
Keele University

Dear Elizabeth

Re: 'GP's attitudes, beliefs and behaviours regarding exercise for chronic knee pain: a pilot questionnaire study'

Thank you for submitting your revised project for review.

I am pleased to inform you that your project has been approved by the Ethics Review Panel.

The following documents have been reviewed and approved by the panel as follows:

Document	Version	Date
Management of CKP - Protocol	1.0	14-10-11
Management of CKP – Flow Chart	1.0	14-10-11
Management of CKP_a – Questionnaire	1.0	14-10-11
Management of CKP_b – Questionnaire	1.0	14-10-11
Management of CKP_c – Questionnaire	1.0	14-10-11
Management of CKP_d – Questionnaire	1.0	14-10-11
Management of CKP_a – Cover Letter	2.0	07-11-11
Management of CKP_b – Cover Letter	2.0	07-11-11
Management of CKP_c – Cover Letter	2.0	07-11-11
Management of CKP_d – Cover Letter	2.0	07-11-11
Management of CKP – Reminder Postcard	1.0	14-10-11
Management of CKP_a – Follow Up Letter	2.0	07-11-11
Management of CKP_b – Follow Up Letter	2.0	07-11-11
Management of CKP_c – Follow Up Letter	2.0	07-11-11
Management of CKP_d – Follow Up Letter	2.0	07-11-11
Evidence of sponsor indemnity	-	21-07-11
Peer review response AB	-	25-08-11
Peer review response RW	-	12-09-11
Approved peer review application	-	23-09-11

If the fieldwork goes beyond the date stated in your application (October2012), you must notify the Ethical Review Panel via Michele Dawson.

If there are any other amendments to your study you must submit an 'application to amend study' form to Michele Dawson. This form is available from Michele (01782 733588) or via http://www.keele.ac.uk/researchsupport/researchethics/

If you have any queries, please do not hesitate to contact Michele Dawson in writing to m.dawson@uso.keele.ac.uk

Yours sincerely

M. Dawson

pp

Dr Roger Beech
Chair – Ethical Review Panel

CC RI Manager, Supervisor

Figure XII-C Pilot Study R&D approval

NHS North Staffordshire
NHS Stoke on Trent
South Staffordshire PCT

RM&G Department
Staffordshire Cluster PCTs
St Georges Chambers
31 Merrial Street
Newcastle under Lyme
Staffs
ST5 2AG

Tel: 03001230995, Ext: 6598

lianne.doughty@staffordshirecss.nhs.uk

Dr Elizabeth Cottrell
NIHR Academic Clinical Fellow
Arthritis Research UK Primary Care Centre
Primary Care Sciences
Keele University
Keele
Staffordshire
ST5 5BG

4th October 2012

Dear Dr Cottrell

Confirmation of Approval of Research Study

I can confirm that **approval** has been granted by the Staffordshire Cluster of PCTs Research Management and Governance Office for the following research study, which falls under the requirements set out in the NHS Research Governance Framework to take place in the Staffordshire Cluster of PCTs (North Staffordshire PCT locality).

Title:	Management of chronic knee pain: a pilot study of GPs (version 1.0)
Study Reference:	CLRN WMN 11723
Chief Investigator:	Dr Edward Roddy
Sponsor:	Arthritis Research UK Primary Care Centre, Keele University
Funder:	NIHR Academic Clinical Fellowship in General Practice
Research Location(s):	North Staffordshire Primary Care Research Consortium NHS North Staffordshire c/o Arthritis Research UK Primary Care Centre, Primary Care Sciences, Keele University
NHS Trust(s):	Staffordshire Cluster of PCTs (North Staffordshire PCT)
Proposed local study end date:	06/08/2014

You may begin this research study within the Staffordshire Cluster of PCTS as noted above.

NHS
NHS North Staffordshire
NHS Stoke on Trent
South Staffordshire PCT

Please read carefully, the following additional information that is applicable to this confirmation of approval.

Please note that your research study may be monitored or audited by this research office or other relevant authority as part of the requirements set out in the Research Governance Framework for Health & Social Care (2005).

In order for us to continue to meet the requirements for Research Governance you are requested to provide us with the following documents (electronic or paper) relating to this study:

- A copy of all NRES Annual progress report(s) (if applicable)
- A copy of the NRES End of study declaration
- A copy of the final report no more than 6 months after completion of the study
- A completed monitoring form for Department of Health reporting purposes (the form will be sent to you for completion)

You are also requested to notify us about any of the following that are applicable to the Trust(s) for which this approval applies:

- Amendments to any documents that require REC approval
- Changes to study start and end dates
- Changes in personnel/members of the research team
- Any serious adverse events (e.g., SUSAR) within the timescales specified on the NRES website.

In addition, we will from time to time also request you to provide us with up-to-date details of all practices/ locations that you know will be, are or have been involved in this study.

Yours sincerely,

P.p. Deacon.

Heather Johnstone
Deputy Director of Nursing
Staffordshire Cluster of PCTs

Appendix 13: Cover letters for initial pilot mailing

Figure XIII-A Standard pilot questionnaire initial mailing cover letter

Dr Elizabeth Cottrell
Arthritis Research UK Primary Care Centre
Keele University
Staffordshire
ST5 5BG

e.cottrell@cphc.keele.ac.uk

DATE

Dear

Management of chronic knee pain: a pilot study of GPs
REC Number: XX/XXXXX/XX, Version number: X Date: XX/XX/XXXX

We are inviting you to participate in a research study about chronic knee pain as you have been identified from a random national sample of General Practitioners. We are based at the Arthritis Research UK Primary Care Centre at Keele University and the study is funded by the National Institute for Health Research. We have gained ethical approval for this research from the Keele University Ethical Review Panel. Before you decide whether you would like to participate in the study please read the following information and contact us if you have any further questions. The results of this study will be disseminated through publications and/or presentations at conferences. If you would like a copy of the results sent electronically to you please email Dr Cottrell via the email address given above.

Background to the study: Chronic knee pain is common among individuals aged over 45 years and thus common presents to General Practitioners
Aims of the study: This study aims to identify the current attitudes, beliefs and behaviours of General Practitioners regarding, and their perceived roles in, the management of chronic knee pain. This is part of a larger research programme that is being undertaken by the research centre that aims to inform the development of interventions to support and improve the management of patients with chronic knee pain in primary care.
What are we asking from you? We ask that you complete the enclosed questionnaire. There are no right or wrong answers. Please put your own opinions and thoughts without reference to other material. A pilot of this questionnaire indicated that completion should take no more than **15 minutes**. Return of the completed questionnaire is accepted as your consent to participate in the research. You are free to withdraw from the study at any time, even after returning the questionnaire.
Confidentiality: All information you provide us with will be treated in the **strictest confidence** and used only for the purpose of this research study. Names and addresses are required to administer the study and appropriate reminders, but this information will be held separately from the questionnaire data, which will be analysed **anonymously**. If you provide us with contact details for further research work in this area, your details will be removed from the questionnaire once we receive it.
Study deadline: Please return the questionnaire in the pre-paid envelope enclosed by ****date 6 weeks after start date****
What is in it for you? Respondents have the chance to win £100 worth of Amazon vouchers. Please complete your details at the back of the questionnaire if you wish to be entered into the draw.

What if there is a problem? If you have a concern about any aspect of this study, you may wish to speak to the researchers who will do their best to answer your questions. You should contact Elizabeth Cottrell on 01782 733991 (Tuesdays and Fridays) or email e.cottrell@cphc.keele.ac.uk. Alternatively, if you do not wish to contact the researchers you may contact Nicola Leighton, Research Governance Officer on 01782 733306 or n.leighton@uso.keele.ac.uk. If you remain unhappy about the research and/or wish to raise a complaint about any aspect of the way that you have been approached or treated during the course of the study please write to Nicola Leighton who is the University's contact for complaints regarding research by email or telephone, as above, or at the following address: Nicola Leighton, Research Governance Officer, Research & Enterprise Services, Dorothy Hodgkin Building, Keele University, ST5 5BG

Contact for further information. If you require any further information regarding this study please contact Elizabeth Cottrell by email on e.cottrell@cphc.keele.ac.uk

Your involvement is **voluntary** so you can choose not to take part if you so wish. If you do not wish to take part we would be grateful if you could still return your questionnaire. If you **do not wish** to participate in the study, to improve the quality of our data we would be grateful if you could please supply the following information by **returning the completed answers below with your blank questionnaire** in the pre-paid envelope enclosed:

Please can you indicate one reason below that most closely matches your decision not to participate:

Too little time ☐ I don't understand the questions ☐

Subject not relevant to me ☐ Questionnaire too long ☐

Subject of no interest to me ☐

Other (please state)_____

Please can you provide the following information about you:

What year did you qualify as a GP? _____ Are you: Male ☐ Female ☐

How many GPs work in your practice? _____

Is your practice: Urban? ☐ Semi-rural? ☐ Rural? ☐

Many thanks for your time and participation in this study

Dr Elizabeth Cottrell
NIHR Academic Clinical Fellow
GP Specialty Trainee

Dr Edward Roddy
Clinical Senior Lecturer
Consultant Rheumatologist

Prof Nadine Foster
Professor of Musculoskeletal Health in Primary Care
Physiotherapist

Dr Mark Porcheret
GP Research Fellow

Dr Elaine Thomas
Reader in Biostatistics

Unique survey ID

Figure XIII-B Abbreviated pilot questionnaire initial mailing cover letter

Dr Elizabeth Cottrell
Arthritis Research UK Primary Care Centre
Keele University
Staffordshire
ST5 5BG

e.cottrell@cphc.keele.ac.uk

DATE

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Physiotherapist

Dr Mark Porcheret
GP Research Fellow

Dr Elaine Thomas
Reader in Biostatistics

Unique survey ID

Appendix 14: First pilot reminder mailing postcard

Keele University

Management of Chronic Knee Pain Study

Unique survey ID:

Reminder to participate

We recently sent you a letter, information sheet, questionnaire and FREEPOST envelope inviting you to participate in our *Management of Chronic Knee Pain* study. The aim of this study is to describe the attitudes, beliefs and behaviours of GPs in the UK regarding the management of chronic knee pain in adults over 45 years old. This study will inform future research and the development of interventions to improve the management of chronic knee pain in primary care. You have been chosen at random from a national database of GPs, however your participation is entirely voluntary.

If you **do not** wish to participate please tick this box and return this postcard to us ☐

Please can you indicate one reason below that most closely matches your decision not to participate:

Too little time ☐
Subject not relevant to me ☐
Subject of no interest to me ☐
I don't understand the questions ☐
Questionnaire too long ☐
Other (please state)_____

To improve the quality of our data, we would be grateful for the following information about you:

What year did you qualify as a GP? _____ Are you: Male ☐ Female ☐

How many GPs work in your practice? _____

Is your practice: Urban? ☐ Semi-rural? ☐ Rural ? ☐

If you **do wish** to participate please complete and return the questionnaire by ***date***. If you did not receive the questionnaire or have lost it please contact Dr Elizabeth Cottrell at e.cottrell@cphc.keele.ac.uk

Appendix 15: Cover letters for second pilot reminder mailing

Figure XV-A Second reminder cover letter for standard pilot questionnaire

Dr Elizabeth Cottrell
Arthritis Research UK Primary Care Centre
Keele University
Staffordshire
ST5 5BG

e.cottrell@cphc.keele.ac.uk

DATE

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We have not yet received a response from you but are still very interested to hear from you. We have therefore enclosed another copy of the questionnaire we recently sent you and would be grateful if you could complete this. If you have returned a questionnaire in the last few days we apologise for troubling you again.

Before you decide whether you would like to participate in the study please read the following information and contact us if you have any further questions. The results of this study will be disseminated through publications and/or presentations at conferences. If you would like a copy of the results sent electronically to you please email Dr Cottrell via the email address given above.

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Figure XV-A Second reminder cover letter for abbreviated pilot questionnaire

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Appendix 16: Summary of themes and concepts arising from free-text responses to pilot survey

Original response code (automatically used when response given in tick-box in standard questionnaire)	Associated and additional response code (Themes) (FT = obtained from free-text response)	Free-text responses and concepts included within code (unless explicit from code name)	Implication for future questionnaire design
Diagnosis of index patient			
	FT_Diag_OA	"Early arthritis", "degenerative changes", "degenerative joint disease", "primary osteoarthritis", "OA", "osteoarthritis", "osteoarthritis knee", "mild to moderate OA…PJ compartment", "patellorfemoral arthritis", "retropatella arthritis", "patella degeneration"	
	FT_Diag_prob_OA	Indicators for OA associated with "presumed", "prob"/"probably", "possibly", "likely", "most likely", "provisionally", "may be indicative of", "suspected", "suspect"	
	FT_Diag_WnT	"wear and tear", "possibly a bit of wear and tear", "worn knees", "possibly a bit of wear and tear"	
	FT_Diag_WnR	"wear and tear and repair arthritis"	
	FT_Diag_CKP		
	FT_Diag_prob_CKP	Indicator for CKP associated with "likely"	
	FT_Diag_obesity	"high BMI", "obesity", "overweight"	
	FT_Diag_PFJ	"patellofemoral syndrome", "patellofemoral pain", "anterior knee pain",	
	FT_Diag_other	"maltracking patella", "knee pain ?cause", "knee pain", "meniscal injury", "knee pain looking for a cause", "mechanical knee pain", "ligament knee pain"	
	FT_Diag_none	"none", "I wouldn't give a diagnosis at this stage" (if no response given at all, coded as missing)	

Description of diagnosis		
	FT_Diag_Desc_WnT	“wear and tear” “wearing out”, “wearing of the joint”, “ "wear and tear" but actually needs to keep moving to lubricate the joint”, “showing lots of wear”
	FT_Diag_Desc_WnR	“wear and repair”, “wear and tear/wear and repair”
	FT_Diag_Desc_Arthrit	“osteoarthritis”, “Knee pain ?OA, ?STI, ?ortho”, “arthritic change”, “I am doing an x-ray to see if there is any osteoarthritic damage”, “x-ray will check for arthritic change”
	FT_Diag_Desc_Inflammation	“Inflammation between knee cap and femur”, “inflammation of the joint covering and bone”, “inflammation to the internal surface of the joint”, “inflammation behind the knee cap”
	FT_Diag_Desc_Age	“due to ‘maturity’ of your knee”, “your knees are 58 years old”, “Joint surfaces become less smooth as we get older”, “compatible with her age”, “common problem as you get older” “as years go by”
	FT_Diag_Desc_Early	“early”
	FT_Diag_Desc_Uncert	“we could look at the x-ray result”, “may be…but I need to do some tests to see”, “difficult to diagnose cause. Probably need to observe her response to therapy”, “I am doing an x-ray to see if there is any osteoarthritic damage”, “There may be arthritis present so have x-ray”, “which an x-ray will confirm”, “x-ray will check for arthritic change”, “check for active disease”, “x-rays to look for loose bodies in joint”
	FT_Diag_Desc_Muscle	“imbalance of muscles around knees causes maltracking”, “pain due to…less muscle”, “muscle imbalance”, “weaker muscles”, “muscle strength reduce – exacerbating it”, "should exercise to strengthen muscles”, “I would suggest local muscle strengthening exercises”, “we can help by strengthening muscles” [not used if only ‘exercise’ mentioned]
	FT_Diag_Desc_Cartil	“caused by wearing out of the smooth knee cartilage”, “decrease in cartilage lubricating joint”
	FT_Diag_Desc_Jointsurf	“joint surface rough…get pain/swelling due to friction of rough surfaces”, “Joint surfaces become less smooth as we get older”

	FT_Diag_Desc_Overweight	“your wt will aggrevate symptoms”, “possible related to weight”, “would benefit from weight loss”, “due to…weight”, “lose weight”,“strain by carrying extra weight”
	FT_Diag_Desc_Kneecap	“Inflammation between knee cap and femur”, “Patella”
	FT_Diag_Desc_Jointspace	“reduction in joint space b/w knees”
	FT_Diag_Desc_Occup	“the job make it feel worse but isn't the case”, “You have a job that requires considerable standing”, “you obviously have a physical job”, “due to job”
	FT_Diag_Desc_ExtentDam	“Unlikely to be due to significant tissue damage”, “mild”, “mild to moderate”, “unlikely severe problem”
	FT_Diag_Desc_Strain	“strain by carrying extra weight”, “putting strain on your knees”, “weight loss to reduce the stress and strain on your knees” “soft tissues reaction to stress on the knee”
	FT_Diag_Desc_Other	“Irritable knees” “imbalance of muscles around knees causes maltracking”,
Future		
	FT_Fut_Pos	“Good” “should be able to strengthen the knees with physio and relieve most of the pain” “Reassure” “one off” “The arthritis will always be there. We can generally control your discomfort” “ Be optimistic that as no significant damage outlook is good”
	FT_Fut_Dep_Pt	Suggests can be changed/improved by weight loss, muscle strengthening, regular exercise, attitude of patient etc “depends on what you can do for yourself” “If she doesn’t lose weight – pain will persist” “Continuing pain unless you lose weight” “best to continue to use joint ‘if you don’t use it you lose it’”
	FT_Fut_Neg	“Can lead to pain and loss of function” “Could improve but likely some pain long term”, “The knee problem could get worse” “Likely to become worse with time” “Pain may become more frequent or more severe” “May not worsen but often does gradually” “The knee will get worse with time but very slowly” “ Could end up in reconstruction arthroplasty”

	FT_Fut_Variable	Describes fluctuating symptoms waxing/waning, flares, relapse/remission, sometimes worse that others, “tear and repair”	
	FT_Fut_Treatment	Medicatio, Physio, Surgery - “Can be improved with regular…paracetamol may need total knee replacement” “should be able to strengthen the knees with physio and relieve most of the pain” “advise re pain relief”	
Investigation of index patient Include options if definite response or associated with phrases such as “if patient requests it”, “possibly”, “consider, “maybe”, “perhaps”, “?” as suggests intent to do this option at this point and implies GP thinks this is an appropriate option. As question specifically relating to ‘at this point’ exclude options if mentioning plans for future			
Ix_none	FT_Ix_none	“None, unless patient had strong wish x-ray” “either none or x-ray both knees depending on d/w patient”	
Ix_lab	FT_Ix_lab	FBC, U&E, LFT, CRP, ESR, Inflammatory markers, Uric acid, RhF, Glucose, HbA1c, TFT, Cholesterol/lipids, EP, vit D, “routine bloods”, ““If he needed ix…screen re cholesterol…””	Consider adding option for GPs to indicate lab tests they would request
Ix_image	FT_Ix_image	No responses at all – free-text or tick box	Remove from options
Ix_KXR	FT_Ix_KXR	Unilateral or bilateral knee x-rays “x-ray” “x-ray depending on full hx including PMH” “If major patient concern may request an x-ray” “either none or x-ray both knees depending on d/w patient” “Discuss R knee x-ray” “If he needed ix x-ray…” “None, unless patient had strong wish x-ray” “Knee x-ray if patients wished referral” “Consider plain x-ray” “PFJ views”	Consider adding option for L knee, R knee or bilateral x-ray Consider adding option for GPs to respond with utility of each suggested investigation – for diagnostic, prognostic or referral/management reasons
Ix_otherXR	FT_Ix_otherXR	Hip, chest	
Ix_SFA	FT_Ix_SFA	No responses at all – free-text or tick box	Remove from options
Ix_other	FT_Ix_other_oxford	Oxford knee score used	Add this category to multiple response option
	FT_Ix_other_dep	Depression screening questionnaire administered	Add this category to multiple response option

Referral of index patient Include options if definite response or associated with phrases such as “possibly”, “consider, “maybe”, “perhaps”, “?” as suggests intent to do this option at this point and implies GP thinks this is an appropriate option. As question specifically relating to ‘at this point’ exclude options if mentioning plans for future such as “thereafter”, “after”			
	FT_Refer_physio	Add positive response whenever physio referral mentioned in another section of questionnaire “PT”, “Physio”, “Physiotherapy”, “Physiotherapist”, “Physio assessment unit”	Consider adding in desired outcome free-text space ?education ?exercise
	FT_Refer_MSK	“Musculoskeletal clinical assessment and treatment service”, “Musculoskeletal clinic”	Consider adding in desired outcome free-text space ?physio ?imaging
	FT_Refer_weight_loss	“Weight management service”, “In house trainer for weight management advice”	
	FT_Refer_occ_health		
	FT_Refer_ex_prog	“exercise on prescription” “sports activities programme”	
	FT_Refer_diet		
	FT_Refer_ortho		
Management of index patient			
Rx_NSAIDs	FT_Rx_NSAIDs		
Rx_paracetamol	FT_Rx_paracetamol		
Rx_opiates	FT_Rx_opiates		
Rx_COX2	FT_Rx_COX2		
Rx_antidepressants	FT_Rx_antidepressants		
Rx_top_NSAID	FT_Rx_top_NSAID		
Rx_inj_hyal	FT_Rx_inj_hyal		
Rx_inj_ster	FT_Rx_inj_ster	“joint injection”	
Rx_top_cap	FT_Rx_top_cap	“rubefactant”	
Rx_insole	FT_Rx_insole		
Rx_heat	FT_Rx_heat		
Rx_TENS	FT_Rx_TENS		
Rx_rest	FT_Rx_rest		
Rx_bed_rest	FT_Rx_bed_rest		
Rx_Quad_strength	FT_Rx_Quad_strength	“thigh exercises” “encourage exercise to strengthen leg muscles” “leg strengthening exercises”, “knee exercises”,	
Rx_gen_ex	FT_Rx_gen_ex	“exercises” [with nil other description], “non-weight bearing exercises”, “gentle exercise” “swimming”	Consider additional response option to capture

			maintaining/encouraging “activity” or “mobility” separate from ‘general exercise’ ?under advice
Rx_ice	FT_Rx_ice		
Rx_stick	FT_Rx_stick		
Rx_acupun	FT_Rx_acupun		
Rx_none	FT_Rx_none		
Rx_other	FT_Rx_other_simple_analgesia	“simple analgesia”, “OTC analgesia”, “analgesia”	
	FT_Rx_other_support	“knee support”, “supportive bandage”	
	FT_Rx_other_PPI		
	FT_Rx_other_alternative	“rosehip”, “magnetic band” “cod liver oil”	
	FT_Rx_other_glucosamine		
	FT_Rx_other_Health_Check		
	FT_Rx_other_taping		
	FT_Rx_other_misc	“Lifestyle changes” (but no examples given) “Gentle leg massage” “Topical treatment” (but no examples given) “rubefactant”	
Exercise type			
	FT_ET_walk	“Walking”	
	FT_ET_cycle	“Cycling”	
	FT_ET_gym	“Gym”	
	FT_ET_swim	“Swimming”	
	FT_ET_quad_strength	“Muscle strengthening” “Quadriceps strengthening exercise” “Leg extensions with medial muscles engaged” “Quads drill” “home quads building exercises” “straight leg raises” “local muscle strengthening” “vastus medialis exercises”	
	FT_ET_squats	“Squats”	
	FT_ET_stretches	“extension” “hamstring stretches”	
	FT_ET_aerobic	Used if “aerobic exercise” specifically mentioned “All exercise particularly aimed at wt control – i.e. aerobic and fun” “aquaerobics” “cardiovascular”	
	FT_ET_inc_mobil	“Increased general mobility” “general increased activity”	
	FT_ET_ROM	“I would show her some exercises to improve the range of motion to her knees”	

	FT_ET_NWB	“Non-weight bearing”	
	FT_ET_WB	“weight bearing”	
	FT_ET_ADL	“Continue general day to day activities”	
	FT_ET_gentle	Term “gentle” “light” “low impact” or “mild” used in description of exercise type	
Exercise advice			
	FT_EA_freq	“exercise 5x/week” “as much as possible”	
	FT_EA_intens	Start gently, gradually increase, indicators of adequate intensity e.g. “feel SOB with walking”, alluding to intensity e.g. “don’t over do it”, “within limits” avoiding straining knee e.g. “avoiding high impact exercises on knees”	
	FT_EA_targ_outcome	Improve general health and wellbeing, weight loss, increase/maintain mobility and/or function, reduce pain, prevent deterioration, keeps joints ‘lubricated’	
	FT_EA_duration	“exercise which is maintained” “aiming to do 1 hour/day in the long run”	
	FT_EA_pain_resp	“walk within pain”, “if pain gets worse then stop”, “do not do if painful” “not too painful” “walking when not in pain”	
	FT_EA_demonstrate	“I can demonstrate quads exercises”	
	FT_EA_describe_spec_ex	Types of general exercise patient can do e.g. swimming, cycling, badminton/squash or description of how to do quadriceps strengthening exercise	
	FT_EA_give_leaflet		
	FT_EA_ADLs		
	FT_EA_add_ex_harm	Not harmful to exercise (or to experience pain when exercising)	
	FT_EA_MoA	Strengthening muscles around knee +/- statement that this strengthens joint or protects joint e.g. from strain, increasing movement of the joint	
	FT_EA_non_spec	"Try and do non-weight bearing exercises" “Continue to exercise - important to move joint” “Directed by physio or similar” “Keeping joints moving is helpful in arthritis” “It needs to be fun not a chore”	Consider condensing into patient initiated and doctor initiated will not change coding but reorganise to ‘planned’ and ‘opportunistic’

Exercise check			
	FT_Ex_check_using_other_ind	Explicit professional/service aside from to follow-up unspecified “Review in wt control program”	
	FT_Ex_check_time_spec	2-3wk, 3-4wk, 4-6wk, 1-2months, 6 weeks, 6-8wk	
	FT_Ex_check_adhoc	“ During the medication reviews or general reviews I would enquire”	
	FT_Ex_check_fail_improv	“ As would ask her to reattend if things weren't helping”	
	FT_Ex_check_telephone	“ Telephone review for pain assessment”	
	FT_Ex_check_weight	“Review in wt control program” “Weight monitoring” “weight pt” “weight monitoring” “Measuring her BMI/weight”	
	FT_Ex_check_function	“ ROM exs and review. Telephone review for pain assessment” “ Ask her how she is getting on, what is she doing now?” “recovering her exercise tolerance”	
Written information supplied			
	FT_Writ	Written advice or leaflet given but no details from where or about what	Consider taking free-text space out and giving option on content of information
	FT_Writ_OA_leaf	Written advice or leaflet about knee pain or knee OA suggested e.g. “booklet re OA knee”	
	FT_Writ_ex_leaf	Written advice or exercise leaflet suggested e.g. “supply physio exercise sheet”	
	FT_Writ_patient_website	Respondent mentioned patient.co.uk website	Consider adding option for source of info
	FT_Writ_summit_website		
	FT_Writ_ARUK	“Arthritis Research” “ARC”	
	FT_Writ_PIL	Information obtained through emis, Mentor, vision, unspecified	
Advice to index patient			
	FT_Adv_weight_loss	Any reference to weight loss from Q3.8 or Q3.10 standard questionnaire and Q2.4 short questionnaire or referral to weight management programme	Add specific weight-loss response option to management options to improve consistency of placement of this response
	FT_Adv_keep_act	“keep mobile but not excessively so” “keeping active”, “mobility”/”mob”, “Try to keep active”, “keep active”, “continue to move”, “encourage her to keep active”,	Add this as a specific response option

		“ sports activities”, “advise gym”, “encourage activity”, “ encourage to remain fit and active”, “maintaining activity”
	FT_Adv_fu_plan	
	FT_Adv_red_flag	
	FT_Adv_nature_OA	
	FT_Adv_occ	
	FT_Adv_footwear	
Role of GP in exercise as a treatment for CKP		
	FT_Role_advise	Advise, encourage, promote, advocate, recommend, facilitate use of exercise
	FT_Role_written_info	Provide written information
	FT_Role_significant	Significant role, main advisor, overall management, central role of GP management, integral part of the job, role is ‘essential’
	FT_Role_limited	Limited, brief, basic, simple, “not great at detailing the specific” detail/information
	FT_Role_monitoring	Monitoring pain, exercise, symptoms, ability to work, follow-up, review
	FT_Role_refer	Refer to other service providers or suggest self referral
	FT_Role_reassure	Reassure about (safety of) exercise, reassure about the condition
	FT_Role_red_flag	Elicit red flags
	FT_Role_prescribe	
	FT_Role_demonstrate	Demonstrate exercises “give basic 1-2 exercises”
	FT_Role_diagnose	Including psychological comorbidity
	FT_Role_barrier_time	Time deficient to undertake as much as a role as they feel they should have or patients need
	FT_Role_barrier_skill	Insufficient skill or knowledge (or confidence in these) to undertake as much as a role as they feel they should have or to advise on specifics
	FT_Role_FUnotposs	“I think any follow-up should be by someone else not sure who”
	FT_Role_GPgen_Physiospec	“Minimal… I feel it is the domain of the manual therapists e.g. physios”

Implementing guidelines		
	FT_Exp_Guid_none	Do not use any guidelines
	FT_Exp_Guid_SIGN	Uses SIGN guidelines
	FT_Exp_Guid_easy	Guidelines simple or easy to implement
	FT_Exp_Guid_surg1st	Referral for surgery before guidelines recommend it
	FT_Exp_Guid_local	Use local guidelines and/or education by local clinicians
	FT_Exp_Guid_accesslim	Use of guidelines limited by difficult access to them
	FT_Exp_Guid_presc	Uses guidelines to inform prescribing
	FT_Exp_Guid_promotex	Use of guidelines has promoted exercise use
	FT_Exp_Guid_writteninfo	Uses written information to help to implement guidelines
	FT_Exp_Guid_cohesiveapp	Difficulty getting team to work to same guideline or not knowing what guidelines to use (e.g. if a locum)
	FT_Exp_Guid_timelimit	Time limits restrict full adherence to guidelines – e.g. uses selective parts only
	FT_Exp_Guid_servlimit	Access to services limits adherence to guidelines
	FT_Exp_Guid_refcrit	Uses guidelines to inform referral
	FT_Exp_Guid_overload	Describes guideline overload
	FT_Exp_Guid_comprehen	Informs development of appropriate and comprehensive plans (but not necessarily using every aspect)
	FT_Exp_Guid_dubiousevid	Unclear about strength of underlying evidence base at times

ARC = Arthritis Research Campaign; BMI = body mass index; CKP = chronic knee pain; CRP = C-reactive protein; EP = electrophoresis; ESR = erythrocyte sedimentation rate; FBC = full blood count; GP = general practitioner; LFT = liver function test; OA = osteoarthritis; OTC = over the counter; PMH = past medical history; ROM = range-of-movement; SOB = shortness of breath; TFT = thyroid function test; U&E = urea and electrolytes

Appendix 17: Pilot survey questionnaire response changes

Respondent ID	Response	Better position for response	Action	Implication for future questionnaire design
248	Positive response in *Ix_other* and free-text "SUA +/- CRP"	*Ix_lab*	Inserted positive response under *Ix_lab* and removed positive response from *Ix_other*	Consider adding options for individual lab tests
287	Positive response in *Ix_other* and free-text "PFJ views"	*Ix_KXR*	Inserted positive response under *Ix_KXR* and removed positive response from *Ix_other*	
510, 790	Suggested weight loss in *Ix_other*	Advice *FT_Adv_weight_loss*	Inserted positive response under *FT_Adv_weight_loss*	
268, 278, 406, 423, 444, 454, 480, 519, 544, 550, 588, 592, 597, 633, 647	Indicated they would make a referral when giving management approach (Q3.8 standard questionnaire, Q2.4 short questionnaire) but had not replied "yes" to specific referral question (Q3.4, Q2.2 respectively)	Positive response to Q3.4/Q2.2	Inserted positive response under Q3.4/Q2.2 *Refer* column and populated to whom under *Refer_to_whom*	Consider giving referral options as multiple response as referral to physiotherapy, musculoskeletal service and weight management programme commonly not suggested here
595	Suggested Oxford Knee Score under management (Q2.4 short questionnaire)	*Ix_other*	Inserted positive response under new investigation code *FT_Ix_other_oxford*	Add this category to multiple response option for investigations
628	Suggested U&E under management (Q2.4 short questionnaire)	*FT_Ix_lab*	Inserted positive response under *FT_Ix_lab*	
62, 103, 544, 595, 608, 771	Physio referral suggested in Q3.4 standard questionnaire or Q2.2 short questionnaire but no quadriceps strengthening or general exercise option ticked in management Q3.8 or Q2.4 respectively	*Rx_gen_ex* or *FT_Rx_gen_ex*	Inserted positive response under *Rx_gen_ex* or *FT_Rx_gen_ex*	
4, 42, 51, 63, 252, 277, 327 [278, 306, 344 had suggested weight loss in 3.8 and 3.10]	Suggested only weight loss in *Rx_other* option of Q3.8 standard questionnaire	Advice *FT_Adv_weight_loss*	Inserted positive response under *FT_Adv_weight_loss* and removed positive response from *Rx_other*	Add specific weight-loss response option to management options to improve consistency of placement of this response

214, 382	Suggested codeine/co-codamol in *Rx_other* option of Q3.8 standard questionnaire	*Rx_opiates*	Inserted positive response to *Rx_opiates* and removed positive response from *Rx_other*	Consider grouping response options more clearly e.g. into columns of lifestyle, medications, physical therapies, aids (explicitly or covertly)
278	Suggested referral to weight management service under *Rx_other*	Positive response to Q3.4 and *FT_Adv_weight_loss*	Inserted positive response under Q3.4/Q2.2 *Refer* column and populated to whom under *Refer_to_whom* and inserted positive response to *FT_Refer_weight_loss* and *FT_Adv_weight_loss.* Removed positive response from *Rx_other*	
25	Had given positive response for *Other_advice* and suggested physio but had already given positive response in *Refer* column for this	Nil	Remove positive response from *Other_advice*	
40, 41, 100, 141	Had given positive response for *Other_advice* and suggested keeping active	*FT_Adv_keep_act*	Insert positive response to *FT_Adv_keep_act*	
55	Had given positive response for *Other_advice* and suggested "depression questionnaire"	*FT_Ix_other_dep*	Insert positive response under *FT_Ix_other_dep*	
89, 237	Had given positive response for *Other_advice* and suggested "encourage exercise to strengthen leg muscles" or "leg strengthening exercises"	*Rx_Quad_strength*	Insert positive response under *Rx_Quad_strength*	
152	Had given positive response for *Other_advice* and suggested "keep mobile and try hot/cold packs…"	*Rx_ice* *Rx_heat*	Inserted positive response under *Rx_ice* and *Rx_heat* and removed positive response from *Other_advice*	
167	Had given positive response for *Other_advice* and suggested "To try rubefactants/heat/alternative therapies such as magnetic band"	*FT_Rx_alternative* *Rx_heat* *Rx_top_cap*	Inserted positive response under *FT_Rx_alternative, Rx_heat* and *Rx_top_cap* and removed positive response from *Other_advice*	

233	Had given positive response for *Other_advice* and suggested "Swimming, cod liver oil"	*Rx_gen_ex* *FT_Rx_alternative*	Inserted positive response under *FT_Rx_alternative* and *Rx_gen_ex* and removed positive response from *Other_advice*
248	Had given positive response for *Other_advice* and suggested rest	*Rx_rest*	Inserted positive response under *Rx_rest* and removed positive response from *Other_advice*
270	Had given positive response for *Other_advice* and suggested keeping active	*FT_Adv_keep_act*	Insert positive response under *FT_Adv_keep_act*
286	Had given positive response for *Other_advice* and suggested "do exercise within capabilities"	*Rx_gen_ex*	Insert positive response under *Rx_gen_ex*
340	Had given positive response for *Other_advice* and suggested "cod liver oil"	*FT_Rx_alternative*	Inserted positive response under *FT_Rx_alternative* and removed positive response from *Other_advice*
394	Had given positive response for *Other_advice* and suggested "non-weight bearing exercise"	*Rx_gen_ex*	Insert positive response under *Rx_gen_ex*
702	Had written "keep mobile but not excessively so" under *Rx_open*	*FT_Adv_keep_act*	Inserted positive response under *FT_Adv_keep_act*
252	Under *Refer_to_whom* had put "Sports activities" and "unfortunately we do not have ready access to dieticians"	*FT_Adv_keep_act*	Inserted positive response under *FT_Adv_keep_act* and *Ft_Refer_diet*
697	Under *Refer_to_whom* had put "advise gym"	*FT_Adv_keep_act*	Inserted positive response under *FT_Adv_keep_act*
444	Under *Rx_open* had put "encourage activity e.g. swimming"	*FT_Adv_keep_act* *FT_Rx_gen_ex*	Inserted positive response under *FT_Adv_keep_act* and *FT_Rx_gen_ex*
62, 103, 400	Under *Exercise_type* had suggested types of general exercise "cycling", "non-weight bearing" and "swimming"	*Rx_gen_ex*	Inserted positive response under *Rx_gen_ex*
59, 252	Under *Exercise_type* had suggested referral to exercise programme but not stated this under StQ 3.4	*FT_Refer_ex_prog*	Inserted positive response under *FT_Refer_ex_prog*

76, 115	Under *Exercise_type* had suggested giving patient a leaflet containing exercise advice	*FT_Writ_ex_leaf*	Inserted positive response under *FT_Writ_ex_leaf*
384	Under *Exercise_type* had suggested increased activity	*FT_Adv_keep_act*	Inserted positive response under *FT_Adv_keep_act*
42, 67, 185, 231, 275, 80, 152, 112	Under *Exercise_advice* had suggested “be active” “keep active” “keep mobile” “keep moving”	*FT_Adv_keep_act*	Inserted positive response under *FT_Adv_keep_act*

Appendix 18: Pilot survey supporting data tables

Table XVIII-A Neither agree nor disagree responses according to mailing round

Attitude statement	Proportion of 'neither agree or disagree' response according to response round		
	Y1 (n=53)	Y2 (n=63)	Y3 (n=56)
Items relating to the benefits of exercise			
Increasing overall activity levels stops the knee problem getting worse	38%	37%	32%
Quadriceps strengthening exercises for the knee are safe for everybody to do	28%	32%	31%**
General exercise, for example walking or swimming is safe for everybody to do	27%*	10%***	18%
Increasing the strength of the muscles around the knee stops the knee problem getting worse	25%	33%^^	27%
Exercise is effective for patients if an x-ray shows severe knee osteoarthritis	25%	30%	21%
Exercise works just as well for everybody, regardless of the amount of pain they have	19 %	32%	27%**
Knee problems are improved by quadriceps strengthening exercises	15%*	22%	18%
GPs should prescribe quadriceps strengthening exercises to every patient with chronic knee pain	11%	25%	20%
Knee problems are improved by general exercise, for example walking or swimming	10%*	11%	16%
GPs should prescribe general exercise, for example, walking or swimming, for every patient with chronic knee pain	9%	6%	11%
Items relating to the delivery of and adherence to exercise			
GPs should follow-up patients to monitor extent of continuation of exercises	32%	38%	38%
A standard set of exercises is sufficient for every patient with chronic knee problems	23%	40%	27%
How well a patient complies with their exercise programme determines how effective it will be	17%	10%	9%
Exercise for chronic knee pain is only effectively provided by physiotherapists	13%	7%^	14%
Time constraints prevent GPs from providing advice on individual exercises for chronic knee pain	13%	18%	13%**
It is important that people with chronic knee pain increase their overall activity levels	11%	5%	18%
Exercise for chronic knee pain is most beneficial when it is tailored to meet individual patient needs	11%	11%^	13%
Exercise for chronic knee pain would be used more frequently if access to physiotherapy was easier	8%*	11%	11%**
It is the patient's own responsibility to continue doing their exercise programme	6%	11%	7%**
Exercise for chronic knee pain should only be used after drug treatment has been tried	4%*	2%	5%
GPs should educate chronic knee pain patients about how to change their lifestyle for the better	2%	0%	0%

*n=52, **n=55, ***n=60, ^n=62, ^^n=61; Y1 = responses received after initial mailing and before postcard mailing; Y2 = responses received after postcard mailing and before final mailing; Y3 = responses received after final mailing

Table XVIII-B Experiences of GPs of implementing guidelines in the management of CKP

Experience of using guidelines for the management of chronic knee pain in the general practice setting	Proportion providing response (n=39)
Guidelines used, aside from NICE OA guidelines	
Use local guidelines and/or education by local clinicians	5%
Use SIGN guidelines	3%
Implementation of guidelines	
Implementation of guidelines is easy	3%
Difficulty accessing guidelines	3%
Use guidelines to inform aspects of management	
Prescribing medications	15%
Development of appropriate and comprehensive plans	8%
Promoted exercise use	5%
Referral	3%
Difficulties with using guidelines	
Uses written information to help to implement guidelines	15%
Time limits restrict adherence to guidelines	8%
Unclear about strength of underlying evidence base at times	5%
Access to services limits adherence to guidelines	3%
Describes guideline overload	3%
Deviations from guidelines	
Do not use any guidelines	13%
Difficulty in getting the team to work to guideline	5%
Referral for surgery before guidelines recommend it	3%

NICE = National Institute for Health and Care Excellence; OA = osteoarthritis; SIGN = Scottish Intercollegiate Guideline Network

Table XVIII-C Means by which GP would check vignette patient was completing her exercise programme

Strategy*	Total (n = 29)	Further detail
Planned follow-up		
At follow-up or review appointment	59%	
Timescale for follow-up specified	21%	2-3wk, 3-4wk, 4-6wk, 1-2m, 6wk, 6-8wk
Follow-up suggested with other specified professional/service	10%	Weight control programme (n = 1) Physiotherapy (n = 2)
Assessment undertaken by telephone	3%	
Measures to be used at follow-up		
Measurement of weight/BMI calculation	17%	
Assessment of function	10%	"*ROM exs…"; "Ask her how she is getting on, what is she doing now?"; "…recovering her exercise tolerance"*
Assessment of pain	3%	
Opportunistic follow-up		
Ad hoc enquiry of exercise completion	7%	During medication/general review At a 'further appointment'
Prompted by failure to improve	7%	

*Items not mutually exclusive

Appendix 19: Summary of changes to the final survey tool arising from the pilot survey results

Table XIX-A Changes to the survey tool design, method and sample size for the main survey arising from the pilot results

Use in the pilot survey	Issue and/or result of pilot survey	Use in main survey
Survey methodology		
Incentive offered to half of the sample	Response did not differ between those who were offered an incentive and those who were not (21% vs 23%)	Incentive not offered
Questionnaire sent in October	GPs reported not having time to complete the questionnaire	Ideal timing of the survey mailings should avoid common holiday periods and financial end of year
Two reminder mailings	One third of responses received after each reminder mailing	Two reminder mailings
Advertised deadline for responses 6 weeks from baseline mailing	Responses obtained between 6-11 weeks and one received after 11 weeks	Aim for deadline for responses by 8 weeks following initial questionnaire mailing
Obtaining the sample		
Recipients of the questionnaire who were not GPs or had not managed CKP in the last six months were asked to indicate this on the front of the questionnaire and return it	The proportion of recipients indicating they met exclusion criteria was low (2%)	Sample size calculated without adjusting for ineligible GPs
Data regarding use of exercise obtained from open and closed questions in the different questionnaires	Differences in use of exercise observed between two types of question format	Sample size calculated using the proportion of GPs suggesting exercise of any type elicited from the specific closed question in the StQ to estimate the expected use of exercise (85%)
Questionnaire design		
Half the sample were sent a StQ and half an AbQ	There was no significant difference in response between those receiving the StQ versus the AbQ (21% vs 23%)	Questionnaire length same as the StQ
Items relating to the investigation and management of the vignette patient were given in a closed format in the StQ and open format in AbQ	Differences in the frequencies of responses arising from different question formats were identified, usually with frequency of use of certain management strategies being higher among respondents to closed questions Free-text responses sometimes vague Free-text responses were onerous to code and may be burdensome to complete	Use of open questions requiring free-text responses minimised

Multiple response option questions were given for the majority of questions in both questionnaires	Novel responses were given in 'other' response options – sometimes these responses fitted better with other items on the questionnaire	Response options updated where appropriate to reflect pilot responses and to capture data that was given inconsistently throughout the questionnaire (e.g. weight loss advice)
An 'other' response option was given for multiple-response option questions	The 'other' option did occasionally produce novel responses that were appropriately placed in the questionnaire	'Other' option retained for multiple response questions

AbQ = Abbreviated questionnaire; CKP = chronic knee pain; GP = general practitioner; StQ = Standard questionnaire

Table XIX-B Changes to the content of the survey tool arising from the pilot results

Use in the pilot survey	Issue and/or result of pilot survey	Use in main survey
StQ Section 1: About you		
Q1.3 'How do you best describe yourself?' – response options were 'GP partner', 'salaried GP', 'locum GP', 'GP trainer' and 'other'	A GP could be both a trainer and, for example, a partner Only three GPs described themselves as GP trainers	'GP trainer' response was removed
Q1.7 'Do you remember receiving any specific undergraduate training in the field of chronic knee pain?'	In response to both questions 10 GPs responded that they could not remember Value of data obtained was limited by insufficient detail about the nature of the training and heterogeneity about what was classed as 'specific' training	For brevity, given the limited value of data obtained, the item relating to undergraduate training was removed
Q1.8 'Do you remember receiving any specific postgraduate training in the field of chronic knee pain?'		Improve the clarity of wording to 'Do you remember receiving any specific postgraduate musculoskeletal training which contained education about chronic knee pain? (By this we do not mean clinical placements or jobs in rheumatology or orthopaedics)' and remove the 'Don't know or cannot remember' response option
StQ Section 2: Your views about chronic knee pain		
Q2.11-2.13 were asking about responders' views about GPs' roles in general	Results seemed more positive than expected due to candidacy issues outlined in background chapter. Three possible reasons: True responses acknowledging that responders may be biased by virtue of having responded to the questionnaire they are likely to be more interested in the topic than the general population (256,257,339) GPs have responded with the answer they think we wanted to hear – 'social desirability bias' (279) They believed the answers to be true about GPs in general but not necessarily about themselves	Wording of questions enquiring about the GPs' perceived role and priority of CKP changed to enquire about their perceptions about their own roles rather than about GPs in general; for example, 'It is part of a GP's job to manage people with chronic knee pain' was changed to 'It is part of my job to manage people with chronic knee pain'.
Q2.15-2.33 adapted PABS_PT items given with five-point Likert scale	Five-point Likert scale used in adapted PABS_PT	Six-point Likert scale used to enable calculation of treatment orientations
Q2.15-2.33 adapted PABS_PT items used 'chronic knee pain' and 'chronic knee problems' inconsistently	When the statements used by Holden et al (175) in the ABC-Knee study were compared with the original tool (307), a difference was noted. Holden et al used the word 'problem' whereas	PABS_PT items altered to be consistent with original tool, i.e. refer to 'chronic knee pain' rather than 'chronic knee problems'

	the original work used the word 'pain'. To maximise clarity and to ensure that the tool used in the main study is as similar as possible as the original PABS_PT, statements StQ2.15-2.33 should be altered to refer to 'chronic knee pain' rather than 'chronic knee problems'.	
This section was positioned before the vignette-based questions	Items may influence GPs' reported behaviour. Further, feedback from the pre-pilot stage suggested that the long list of attitude statements was daunting/repetitive. The lists cannot be shortened but advice from de Vaus (2014) is to move questions that cause loss of attention to the end of the questionnaire 'where they will do less damage' (279)	Section moved to after the section enquiring about the behaviours of GPs
StQ Section 3: Clinical scenario of a patient with chronic knee pain		
StQ3.3 'What investigations will you do/order for this patient at this point?' – StQ provided tick box response options, AbQ required free-text responses	Knee x-ray and laboratory tests were commonly used however, x-ray of another area, special imaging and synovial fluid aspirate/analysis were only given by 2%, 1% and 0% respondents, respectively. A novel response option, the Oxford Knee Score, was suggested by two responders to the AbQ.	Investigation response options amended to reflect the majority of responses while maintaining brevity – include response options none, blood tests, Oxford knee score, knee x-ray and other
	Responses indicated that the reason for requesting investigations was not simply to confirm the diagnosis but sometimes to, for example, meet referral criteria. In this situation it would be unfair to classify investigations that are not indicated by best practice guidelines as 'inappropriate'.	Fields in which respondents can indicate the reason for their investigation were added – reassure patient, to meet referral criteria, confirm diagnosis, inform treatment, rule out other diagnoses and inform prognosis
StQ3.4 'Would you refer this patient to see someone else at this point?'	Some GPs did not consider referral to certain destinations, such as physiotherapy, weight management and exercise programmes, as 'referrals' in this context but indicated these referrals elsewhere in the questionnaire when communicating their management plans	Referral question reworded to prompt GPs to think about referrals more broadly and to reduce burden of re-coding inappropriately placed results during data cleaning - 'Would you refer the patient to see someone else, either in the primary or community team or into secondary care, at this point?'

StQ3.8 'At this consultation what approaches would you use or suggest to manage this patient?' – StQ provided tick box response options, AbQ required free-text responses	Respondents to the StQ sometimes provided free-text management options which were already given as free-text response options – it is possible that some response options were insufficiently clear, desired responses could not be seen despite being provided. A large differential in the frequency of some responses between closed and open questions was seen, particularly with regards to quadriceps strengthening exercises. Some response options were not used (e.g. 'injection of hyaluronan', 'bed rest' and 'none') other novel responses were given (e.g. 'keep active', 'weight loss', 'glucosamine')	Refine response options for management to: More closely represent the breadth of responses given to the pilot – if a response was not used it was considered for removal ('injection of hyaluronan'), novel responses (e.g. 'keep active', 'weight loss', 'glucosamine') were considered for inclusion in the main survey Improve clarity – e.g. 'non-selective NSAIDs' was changed to 'oral non-selective NSAIDs (e.g. ibuprofen)', 'insoles' was changed to 'advice on footwear', and 'opiates' was changed to 'weak opioids (e.g. codeine)' and 'strong opioids (e.g. morphine, tramadol)' Assist identification of relevant response - response options ordered into logical groups Minimise over-reporting - combine 'general exercise' and 'quadriceps strengthening exercises' into a single 'exercise' option and ask for detail of the type of exercise and how this would be undertaken later
StQ3.11-3.12 GPs who stated they would use exercise in the management question were asked to answer further free-text questions about the type of exercise they would suggest and the associated advice they would give	Response to the type of exercise suggested was good and a wide range of relevant options were highlighted. However, the value of responses to the item enquiring about advice given was limited, many GPs responded with statements relating to 'keeping active' and, because of the heterogeneity of responses, data coding was burdensome. Responses failed to illustrate what GPs actually *do* when implementing exercise among these patients.	Items enquiring about implementation of exercise into a management plan, and the GPs' perceived role in this, redeveloped to: refine the focus on how GPs incorporate exercise into a management plan establish what GPs actually do enquire about what GPs would like to do but cannot do due to various barriers
StQ3.9 'Do you usually provide written information for patients in this situation?' – space for respondents to provide details of their written information	Responses sometimes focused on the source of the information and sometimes the content (i.e. exercises, disease information), but not always either or both. As most GPs who provided details of the sources used mentioned patient.co.uk/EMIS mentor or the UK arthritis charities	The item relating to written information provided needed to be simplified into multiple response options of sources informed by the pilot results and GPs are to be invited to send in copies of information provided

StQ3.10 'Would you offer any other advice as part of your treatment?'	The value of the item was limited as the responses given were heterogeneous and related to red flags, further information about the nature of the disease, future options/follow-up, occupation, keeping active and lifestyle.	The item asking for other advice given was removed and responses from this item informed refinement of multiple response options to other questions
Section ordered as follows: symptom and knee damage severity, investigations, referral, diagnosis, description of diagnosis, future, management, written information and other advice	The flow of the section did not follow the order of a conventional consultation	The ordering of items within this section needed revising to align the flow with that of a more typical GP consultation
Section 4: Your views about the role of exercise in treating chronic knee pain		
StQ4.18 'Exercise for chronic knee pain is only effectively provided by physiotherapists'	Feedback from the pilot was that use of the word 'only' too strong – therefore felt that would be more appropriate to softening wording to 'most effective when' rather than 'only effectively'	Item changed to 'Exercise for CKP is more effectively provided by physiotherapists than GPs'
StQ4.22 'What do you feel is your role as a GP in exercise as a treatment for chronic knee pain?'	Not all responses related directly to roles with regards to exercise provision but the role of GPs more generally, for example to diagnose, prescribe and elicit red flags. Among responses that did relate to roles in providing exercise, there was heterogeneity in the focus of responses, for example some gave explicit roles they felt they hold, others provided detail of what their role does not include and others stated the factors that prevent them doing what they wanted to do.	To gain more focused, specific responses and to reduce the burden during analysis, the open question enquiring about perceived roles of GPs in implementing exercise in a management plan was changed to two multiple response option questions which asked GPs to identify their perceived role and to highlight barriers that prevent them from undertaking this role

Section 5: Guidelines		
StQ5.2-5.7 Attitude statements about the credibility, target audience and implementation of NICE guidelines in general	These items had a high level of neither agree nor disagree and a lack of consensus among responses. Although evaluating GPs' views of applicability of guidelines is valuable as it can highlight reasons why guidelines are not followed (104), the non-specific nature of the questions (i.e. about NICE guidelines in general not NICE knee OA guidelines) may have limited the value of these items.	In the interest of brevity, and acknowledging that SIGN guidelines are used in preference to NICE guidelines in Scotland, these items were removed
StQ5.8 'We are interested to hear about your experiences of implementing guidelines in the management of chronic knee pain in the GP setting. Please describe any guidelines you find particularly helpful or relevant positive experiences, concerns about, barriers to use or memorable events regarding using guidelines for managing chronic knee pain'	Few respondents and wide range of focusses for responses, only small numbers of respondents appeared to share a view, but this may under-represent the commonality of that view due to the wide focus of responses	The open question enquiring about experiences of implementing guidelines was removed but responses given informed multiple response options elsewhere in the survey; for example: 'difficulty in getting the team to work to guideline' was incorporated as a response option in the new item for the main survey asking GPs to comment on barriers that prevent the use of exercise 'my GP colleagues do not use or value exercise'

AbQ = Abbreviated questionnaire; CKP = chronic knee pain; GP = general practitioner; NICE = National Institute for Health and Care Excellence; NSAID = non-steroidal anti-inflammatory drug; OA = osteoarthritis; SIGN = Scottish Intercollegiate Guideline Network; StQ = Standard questionnaire

Appendix 20: Main survey tool – paper version

Arthritis Research UK | primary care centre

Keele University

Management of Chronic Knee Pain Study

We are seeking the views of general practitioners who treat patients over 45 years old, with chronic knee pain.

If you **are not** a general practitioner, please tick this box and return the questionnaire without completing it any further ☐

If you **have not** managed someone with chronic knee pain in the last 6 months, please tick this box and return the questionnaire without completing it any further. ☐

This questionnaire should take no more than **20 minutes** to complete.

Return of your completed questionnaire will be interpreted as you providing your consent to participate in this study.

If you would like to participate in this study please either:

- Complete this paper version of the questionnaire and return it to Dr Elizabeth Cottrell, Academic Clinical Fellow GP Specialty Trainee, at the Arthritis Research UK Primary Care Centre, Keele University, Staffordshire, ST5 5BG using the enclosed FREEPOST envelope.
  OR
- Complete the online version of this questionnaire accessible at https://www.surveymonkey.com/s/Management_CKP

If you have any questions about this questionnaire or the study in general you can email Dr Elizabeth Cottrell at e.cottrell@keele.ac.uk

Instructions for completing this questionnaire

- When completing the questionnaire, please try and provide answers that most accurately reflect your usual clinical practice. There are no 'correct' or 'incorrect' answers.
- Where relevant please answer questions by ticking a box e.g. ☑
- Please do not consult any literature while completing this questionnaire.

Thank you for your help with this study

Unique survey ID	

Section 1: About you

1.1 Please state the year in which you qualified as a General Practitioner ☐

1.2 How many General Practitioners work in your practice (including yourself)? ☐

1.3 How do you best **describe yourself** (please tick **one box** only)

☐ GP Partner ☐ Salaried GP ☐ Locum GP

☐ Other, please specify _____

1.4 Is your practice ☐ Urban ☐ Semi-rural ☐ Rural

1.5 Are you ☐ Male ☐ Female

1.6 Are you a **GP with a special interest (GPwSI)** in musculoskeletal conditions?

☐ Yes ☐ No

1.7 Do you remember receiving any specific postgraduate musculoskeletal training which contained education about chronic knee pain? (By this we do not mean clinical placements or jobs in rheumatology or orthopaedics)

☐ Yes ☐ No

1.8 Do you have, or have you ever suffered from chronic knee pain **yourself**?

☐ Yes ☐ No

Section 2: Clinical scenario of a patient with chronic knee pain

Presented below is a clinical scenario of a patient **with chronic knee pain** who presents to you with this problem for the first time. All questions that follow relate to the care you would give this particular patient. Think about the patient's first consultation with you.

Patient: Mrs Jones, 58-year-old Prison Officer

History:
First presentation of gradually worsening bilateral knee pain (right worse than left) over 2 years
No history of trauma
Pain always present when walking and at rest, worst when climbing stairs. No night pain.
Managing activities of daily living. Difficulty gardening.
Stopped going to gym – thinks was making pain worse
Only treatment tried is Ibuprofen once or twice when pain "really bad" – no benefit.
Came today finding work increasingly difficult due to the stairs
Usually well – no comorbidities

Medication: Nil

Examination:
Body Mass Index 33
Knees – bilaterally no effusions. Joint tenderness upon palpation. Bilateral coarse crepitations.
Slightly reduced flexion of the right knee.
Hips – no abnormality detected

2.1 What **diagnosis** would you make at this point?

_____

2.2 Using the words you would use with the patient, ***briefly*** state how you would **describe your diagnosis** to the patient

_____

_____

_____

2.3 The patient's **symptoms** are: (please tick the **one** box that best reflects your opinion)

☐ Very severe ☐ Severe ☐ Moderate ☐ Mild ☐ Very mild

2.4 It is most likely that this patient's symptoms result from **knee damage** that is: (please tick the **one** box that best reflects your opinion)

☐ Very severe ☐ Severe ☐ Moderate ☐ Mild ☐ Very mild

2.5 Using the words you would use with the patient, ***briefly*** describe **what the future is likely to hold** with regards to her knee problem

_____

_____

2.6 What **investigation(s)/assessment(s)** would you do/order for this patient **at this point** and for what reason?

Please tick **all** you would undertake	Please indicate the reason for choosing this investigation (tick all that apply)					
	Reassure patient	To meet referral criteria	Confirm diagnosis	Inform treatment	Rule out other diagnoses	Inform prognosis
☐ None	---	---	---	---	---	---
☐ Blood tests	☐	☐	☐	☐	☐	☐
☐ Oxford knee score	☐	☐	☐	☐	☐	☐
☐ Knee x-ray	☐	☐	☐	☐	☐	☐
☐ Other - please state _____	☐	☐	☐	☐	☐	☐

2.7 **At this consultation**, what approaches would you use, or suggest, to manage this patient? (please tick **all** that apply)

☐ Ice	☐ Keep active	☐ Weak opioids (e.g. codeine)	☐ Topical NSAID
☐ Heat	☐ Provision of walking stick(s)	☐ COX II inhibitor	☐ Paracetamol
☐ Acupuncture	☐ Advice on footwear	☐ Antidepressants	☐ Glucosamine/ chondroitin
☐ Rest	☐ Exercise	☐ Injection of steroids	☐ Topical capsaicin
☐ Weight loss	☐ Bed rest	☐ Oral non-selective NSAIDs (e.g. Ibuprofen)	☐ Strong opioids (e.g. morphine, Tramadol)
☐ None	☐ Transcutaneous electrical nerve stimulation		

☐ Other (please state) _____

If you ticked "Exercise" in question 2.7 please go on to answer question 2.8. If not, please move straight on to question 2.9

2.8 There are a variety of approaches that can be used to manage chronic knee pain in general practice.

Of the following different approaches, **which, if any, would you use for this patient at this point**?

a) General exercises or increasing physical activity

I would use ☐

⇨ If you ***would use*** this strategy, please give details about what you would **actually do** (please tick any that apply)

- ☐ Suggest general exercises ⇨ Please state type of exercise _____
- ☐ Give a leaflet
- ☐ Refer
- ☐ Other ⇨ Please state what other actions you would do _____

I would **not** use ☐

⇨ If you ***would not use*** the strategy ***but would like to***, please tell us **what prevents** you (please tick any that apply)

- ☐ Insufficient expertise
- ☐ Insufficient time
- ☐ Other ⇨ Please state what other reasons prevent you (e.g. patient factors, access difficulties, uncertainty of benefit etc) _____

b) Local knee or quadriceps strengthening exercises

I would use ☐

⇨ If you ***would use*** this strategy, please give details about what you would **actually do** (please tick any that apply)

- ☐ Demonstrate specific exercises
- ☐ Give a leaflet
- ☐ Refer
- ☐ Other ⇨ Please state what other actions you would do _____

I would **not** use ☐

⇨ If you ***would not use*** the strategy ***but would like to***, please tell us **what prevents** you (please tick any that apply)

- ☐ Insufficient expertise
- ☐ Insufficient time
- ☐ Other ⇨ Please state what other reasons prevent you (e.g. patient factors, access difficulties, uncertainty of benefit etc) _____

c) Follow up patient to check to see if she is undertaking exercise on a regular basis

I would use ☐

⇨ If you ***would use*** this strategy, please give details about what you would **actually do** (please tick any that apply)

- ☐ Planned follow-up ⇨ When: Please define number of days/weeks/months _____
  - How: ☐ Face to face ☐ Via telephone
  - With whom: ☐ Yourself ☐ Another professional or service – please state _____
- ☐ Opportunistic follow-up ⇨ When: ☐ If patient fails to improve ☐ Check when patient is next seen with this or any problem
- ☐ Other ⇨ Please state what other actions you would do _____

I would **not** use ☐

⇨ If you ***would not use*** the strategy ***but would like to***, please tell us **what prevents** you (please tick any that apply)

- ☐ Insufficient expertise
- ☐ Insufficient time
- ☐ Other ⇨ Please state what other reasons prevent you _____

2.9	Would you refer the patient to see someone else, either in the primary or community team or into secondary care, at this point?	☐	Yes	☐	No
	If yes, to whom would you refer her?				
2.10	Do you usually provide **written information** for patients in this situation?	☐	Yes	☐	No

If yes, please state the source of your written information

☐ Patient.co.uk or Emis Mentor ☐ Arthritis Research UK (previously known as ARC) or Arthritis Care ☐ Other, please state _____

If you would provide written information, it would be very helpful to see a copy by returning it in the freepost envelope provided (**please write on your unique survey ID**) or by providing us with the link for any online information you access.

We are interested in your clinical opinion about patients **aged 45 years and over** with **chronic knee pain**. In this age group chronic knee pain is almost always due to knee osteoarthritis. Please answer all of the following questions using the definition of chronic knee pain as follows: knee pain and associated symptoms that have been present for more than 3 months not resulting from a fracture, infection, systemic rheumatological problem, metastases or surgery.

Section 3: Chronic knee pain in general practice

		I have never heard about or read it	I have heard of it but not seen it	I have seen it but not read it	I have read the full guideline and/or summary	I have read and consider the guideline when planning management
3.1	How much have you heard about or read the guideline published by NICE in 2008 for the care and management of osteoarthritis in adults? (please tick **one** box)	☐	☐	☐	☐	☐

Please consider **your role** in managing patients aged over 45 years old with chronic knee pain. Please indicate the extent to which you agree or disagree with the statements given by ticking **one** box per row.

		Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
3.2	It is part of my job to manage people with chronic knee pain	☐	☐	☐	☐	☐
3.3	I have enough time to manage patients with chronic knee pain	☐	☐	☐	☐	☐
3.4	Managing patients with chronic knee pain is a priority for me	☐	☐	☐	☐	☐
3.5	Managing patients with chronic knee pain is of clinical interest to me	☐	☐	☐	☐	☐
3.6	It is part of my job to reassure patients about the safety of exercise for chronic knee pain	☐	☐	☐	☐	☐
3.7	It is part of my job to provide patients with chronic knee pain with a written management plan	☐	☐	☐	☐	☐

		I have no role in including exercise in the management	I inform patients that exercise is a management option	I advise patients to use exercise to manage their knee pain	I recommend the types of exercise patients could use	I give information on the type, frequency and duration of specific exercises
3.8	Which statement best describes your role in including exercise in the management plan of a patient with chronic knee pain? (please tick **one** box)	☐	☐	☐	☐	☐

3.9 We are interested to hear about **your experiences of barriers which might prevent the use of exercise** in your management of chronic knee pain. Please tick **all** of the barriers that you have experienced

- ☐ Insufficient time in consultations
- ☐ Insufficient expertise to give detailed information
- ☐ Difficulty accessing physiotherapy
- ☐ Uncertainty about the effects of exercise
- ☐ Patients prefer other management options
- ☐ My GP colleagues do not use or value exercise
- ☐ Uncertainty about the most appropriate type of exercise
- ☐ Uncertainty about the safety of exercise
- ☐ Other (please state) _____

_____

Section 4: Your views about chronic knee pain

Below is a list of **possible causes** for a patient developing chronic knee pain. Please indicate the extent to which you agree or disagree with these causes by ticking **one** box in each row.

		Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
4.1	Hereditary/runs in the family	☐	☐	☐	☐	☐
4.2	Being overweight/obese	☐	☐	☐	☐	☐
4.3	A person's own mental attitude e.g. thinking about life negatively	☐	☐	☐	☐	☐
4.4	A person's emotional state e.g. feeling down, anxious	☐	☐	☐	☐	☐
4.5	Ageing	☐	☐	☐	☐	☐
4.6	Accident or injury	☐	☐	☐	☐	☐
4.7	Manual work	☐	☐	☐	☐	☐
4.8	Sport	☐	☐	☐	☐	☐
4.9	Osteoarthritis	☐	☐	☐	☐	☐
4.10	Changes consistent with osteoarthritis seen on x-ray	☐	☐	☐	☐	☐

When completing the following questions, please consider patients **aged over 45 years old** with **chronic knee pain**. Please indicate the extent to which you agree or disagree with the statements given by ticking one box per row.

		Totally disagree	Largely disagree	Disagree to some extent	Agree to some extent	Largely agree	Totally agree
4.11	Mental stress can cause chronic knee pain even in the absence of tissue damage	☐	☐	☐	☐	☐	☐
4.12	The cause of chronic knee pain is unknown	☐	☐	☐	☐	☐	☐
4.13	Pain is a nociceptive stimulus, indicating tissue damage	☐	☐	☐	☐	☐	☐
4.14	A patient suffering from severe chronic knee pain will benefit from physical exercise	☐	☐	☐	☐	☐	☐
4.15	Functional limitations associated with chronic knee pain are the result of psychosocial factors	☐	☐	☐	☐	☐	☐
4.16	Patients with chronic knee pain should preferably practice only pain free movements	☐	☐	☐	☐	☐	☐
4.17	Therapy may have been successful even if pain remains	☐	☐	☐	☐	☐	☐
4.18	Chronic knee pain indicates the presence of organic injury	☐	☐	☐	☐	☐	☐
4.19	If chronic knee pain increases in severity, I immediately adjust the intensity of my treatment accordingly	☐	☐	☐	☐	☐	☐
4.20	If therapy does not result in a reduction in chronic knee pain, there is a high risk of severe restrictions in the long term	☐	☐	☐	☐	☐	☐
4.21	Pain reduction is a precondition for the restoration of normal functioning	☐	☐	☐	☐	☐	☐
4.22	Increased pain indicates new tissue damage or the spread of existing damage	☐	☐	☐	☐	☐	☐
4.23	There is no effective treatment to eliminate chronic knee pain	☐	☐	☐	☐	☐	☐
4.24	Even if the pain has worsened, the intensity of the next treatment can be increased	☐	☐	☐	☐	☐	☐
4.25	If patients complain of pain during exercise, I worry that damage is being caused	☐	☐	☐	☐	☐	☐
4.26	The severity of tissue damage determines the level of pain	☐	☐	☐	☐	☐	☐
4.27	Learning to cope with stress promotes recovery from chronic knee pain	☐	☐	☐	☐	☐	☐
4.28	Exercises that may be knee straining should not be avoided	☐	☐	☐	☐	☐	☐
4.29	In the long run, patients with chronic knee pain have a higher risk of developing severe functional impairments	☐	☐	☐	☐	☐	☐

Section 5: Your views about the role of exercise in treating chronic knee pain

We are interested in your views about the **role of exercise** in the treatment of **chronic knee pain in patients over 45 years old**. Please indicate the extent to which you agree or disagree with the statements given by ticking one box per row.

		Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
5.1	GPs should prescribe quadriceps strengthening exercises to every patient with chronic knee pain	☐	☐	☐	☐	☐
5.2	GPs should prescribe general exercise, for example, walking or swimming, for every patient with chronic knee pain	☐	☐	☐	☐	☐
5.3	Knee problems are improved by quadriceps strengthening exercises	☐	☐	☐	☐	☐
5.4	Knee problems are improved by general exercise, for example walking or swimming	☐	☐	☐	☐	☐
5.5	Quadriceps strengthening exercises for the knee are safe for everybody to do	☐	☐	☐	☐	☐
5.6	General exercise, for example walking or swimming is safe for everybody to do	☐	☐	☐	☐	☐
5.7	Exercise for chronic knee pain is most beneficial when it is tailored to meet individual patient needs	☐	☐	☐	☐	☐
5.8	A standard set of exercises is sufficient for every patient with chronic knee problems	☐	☐	☐	☐	☐
5.9	GPs should educate chronic knee pain patients about how to change their lifestyle for the better	☐	☐	☐	☐	☐
5.10	It is important that people with chronic knee pain increase their overall activity levels	☐	☐	☐	☐	☐
5.11	How well a patient complies with their exercise programme determines how effective it will be	☐	☐	☐	☐	☐
5.12	GPs should follow up patients to monitor extent of continuation of exercises	☐	☐	☐	☐	☐
5.13	It is the patient's own responsibility to continue doing their exercise programme	☐	☐	☐	☐	☐
5.14	Exercise is effective for patients if an x-ray shows severe knee osteoarthritis	☐	☐	☐	☐	☐
5.15	Exercise works just as well for everybody, regardless of the amount of pain they have	☐	☐	☐	☐	☐
5.16	Increasing the strength of the muscles around the knee stops the knee problem getting worse	☐	☐	☐	☐	☐
5.17	Increasing overall activity levels stops the knee problem getting worse	☐	☐	☐	☐	☐
5.18	Exercise for chronic knee pain is more effectively provided by physiotherapists than GPs	☐	☐	☐	☐	☐
5.19	Time constraints prevent GPs from providing advice on individual exercises for chronic knee pain	☐	☐	☐	☐	☐
5.20	Exercise for chronic knee pain should preferably be used after drug treatment has been tried	☐	☐	☐	☐	☐
5.21	Exercise for chronic knee pain would be used more frequently if access to physiotherapy was easier	☐	☐	☐	☐	☐

Would you be happy for us to contact you again in the future regarding this study?

☐ Yes ☐ No

If you answered YES to the question above please provide your name and contact details below (these details will be kept separately from your responses to the questionnaire):

Name:	
Daytime telephone number:	
Address:	
Email:	

End of Questionnaire

You have reached the end of the questionnaire. Please return the questionnaire in the **FREEPOST** envelope provided.

If you have any questions about this questionnaire or the study in general, you can email Dr Elizabeth Cottrell at e.cottrell@keele.ac.uk

Thank you for taking the time to complete this questionnaire. Your time and participation is greatly appreciated.

Unique survey ID

Appendix 21: Summary of how main survey items map to the underpinning model

Element of the underpinning model		Item(s) in study tool relating to this factor
Beliefs about consequences	Awareness of management recommendations	Q3.1 How much have you heard about or read the guideline published by NICE in 2008 for the care and management of osteoarthritis in adults? Q5.7 Exercise for CKP is most beneficial when it is tailored to meet individual patient needs Q5.8 A standard set of exercises is sufficient for every patient with CKP Q5.10 It is important that people with CKP increase their overall activity levels Q5.11 How well a patient complies with their exercise programme determines how effective it will be Q5.20 Exercise for CKP should preferably be used after drug treatment has been tried
	Knowledge and attitudes about the efficacy of exercise	Q5.3 Knee problems are improved by quadriceps strengthening exercises Q5.4 Knee problems are improved by general exercise, for example walking or swimming Q5.16 Increasing the strength of the muscles around the knee stops the knee problems getting worse Q5.17 Increasing overall activity levels stops the knee problem getting worse Q3.9 We are interested to hear about your experiences of barriers which may prevent the use of exercise in the management of CKP: uncertainty about the effects of exercise
	Factors that may be perceived to influence efficacy of exercise	Q2.1 What diagnosis would you make at this point? Q2.2 Using the words you would use with the patient, briefly state how you would describe your diagnosis to the patient Q2.3 The patient's symptoms are (very) severe, moderate, (very) mild Q2.4 It is most likely that this patient's symptoms result from knee damage that is (very) severe, moderate, (very) mild Q2.5 Using the words you would use with the patient briefly describe what the future is likely to hold with regards to her knee problem Q2.6 What investigations will you do/order for the patient at this point? Q4.1-4.10 Possible causes of CKP Q5.14 Exercise is effective for patients if an x-ray shows severe knee osteoarthritis Q5.15 Exercise works just as well for everybody, regardless of the amount of pain they have
	Knowledge and attitudes about risks/safety of exercises	Q3.9 We are interested to hear about your experiences of barriers which may prevent the use of exercise in the management of CKP: uncertainty about the safety of exercise Q4.11-4.29 adapted PABS_PT items Q5.5 Quadriceps strengthening exercises for the knee are safe for everybody to do Q5.6 General exercise, for example walking or swimming is safe for everybody to do

Social influences		Q3.9 We are interested to hear about your experiences of barriers which may prevent the use of exercise in the management of CKP: my GP colleagues do not use or value exercise
Moral norm		Q5.1 GPs should prescribe quadriceps strengthening exercises to every patient with CKP Q5.2 GPs should prescribe general exercise, for example, walking or swimming, for every patient with CKP
Role and identity		Q3.2 It is part of my job to manage people with CKP Q3.6 It is part of my job to reassure patients about the safety of exercise for CKP Q3.7 It is part of my job to provide patients with CKP with a written management plan Q3.8 Which statement best describes your role in including exercise in the management plan of a patient with CKP? Q5.9 GPs should educate CKP patients about how to change their lifestyle for the better Q5.12 GPs should follow-up patients to monitor extent of continuation of exercises Q5.13 It is the patient's own responsibility to continue doing their exercise programme
Characteristics of healthcare professional		Q1.1 Please state the year in which you qualified as a General Practitioner Q1.2 How many GPs work in your practice? Q1.3 How do you best describe yourself? (GP partner, salaried GP, locum GP, Other) Q1.4 Is your practice urban? Semi-rural? Rural? Q1.5 Are you male? Female? Q1.6 Are you a GP with a special interest in musculoskeletal conditions? Q1.7 Do you remember receiving any specific postgraduate musculoskeletal training which contained education about CKP? Q1.8 Do you have, or have you ever suffered from chronic knee pain yourself?
Beliefs about capabilities	Service-related factors	Q2.8 I would not use [general exercise, local exercise, or follow-up] [due to] insufficient time Q3.3 I have enough time to manage patients with CKP Q3.9 We are interested to hear about your experiences of barriers which may prevent the use of exercise in the management of CKP: insufficient time in consultations, difficulty accessing physiotherapy Q5.19 Time constraints prevent GPs from providing advice on individual exercises for CKP Q5.21 Exercise for CKP would be used more frequently if access to physiotherapy was easier
	GP-related factors	Q2.8 I would not use [general exercise, local exercise, or follow-up] [due to] insufficient expertise Q3.9 We are interested to hear about your experiences of barriers which may prevent the use of exercise in the management of CKP: insufficient expertise to give detailed information, uncertainty about the most appropriate type of exercise Q5.18 Exercise for CKP is only effectively provided by physiotherapists
	Patient related factors	Q3.9 We are interested to hear about your experiences of barriers which may prevent the use of exercise in the management of CKP: patients prefer other management options, exercise does not match patient needs and/or expectations
Intention	Motivation and goals	Q3.4 Managing patients with CKP is a priority for me Q3.5 Managing patients with CKP is of clinical interest to me
Habit/past behaviour		Not formally examined within the questionnaire

Behaviour		Q2.7 At this consultation, what approaches would you use, or suggest, to manage this patient? Q2.8 There are a variety of approaches that can be used to manage CKP in general practice. Of the following different approaches, which, if any, would you use for this patient at this point? General exercises or increasing physical activity, local knee or quadriceps strengthening exercises, follow-up to check to see if she is undertaking exercise on a regular basis. Q2.9 Would you refer this patient to someone else, either in the primary or community team or into secondary care, at this point? Q2.10 Do you usually provide written information for patients in this situation?

CKP = chronic knee pain; GP = general practitioner; NICE = National Institute of Health and Care Excellence

Appendix 22: Main survey tool – electronic version

We are seeking the views of general practitioners who treat patients over 45 years old, with chronic knee pain. This questionnaire should take no more than 20 minutes to complete. Completion and submission of this questionnaire will be interpreted as you providing your consent to participate in this study.

If you have any questions about this questionnaire or the study in general you can email Dr Elizabeth Cottrell at e.cottrell@keele.ac.uk

When completing the questionnaire, please try and provide answers that most accurately reflect your usual clinical practice. There are no 'correct' or 'incorrect' answers.
Please do not consult any literature while completing this questionnaire.

Thank you for your help with this study

***What is your unique survey ID? (see front page of questionnaire or accompanying letter)**

***Are you a general practitioner?**

- ◯ Yes
- ◯ No

***Have you managed someone with chronic knee pain in the last 6 months?**

- ◯ Yes
- ◯ No

Section 1: About you

Please state the year in which you qualified as a General Practitioner

How many General Practitioners work in your practice (including yourself)?

How do you best describe yourself

- ◯ GP Partner
- ◯ Salaried GP
- ◯ Locum GP
- ◯ Other

If other, please specify

Is your practice

- ◯ Urban
- ◯ Semi-rural
- ◯ Rural

Are you

- ◯ Male
- ◯ Female

Are you a GP with a special interest (GPwSI) in musculoskeletal conditions?

- ◯ Yes
- ◯ No

Do you remember receiving any specific postgraduate musculoskeletal training whic contained education about chronic knee pain? (By this we do not mean clinical placements or jobs in rheumatology or orthopaedics)

- ◯ Yes
- ◯ No

Do you have, or have you ever suffered from chronic knee pain yourself?

- ◯ Yes
- ◯ No

Section 2: Clinical scenario of a patient with chronic knee pain

Presented below is a clinical scenario of a patient with chronic knee pain who presents to you with this problem for the first time. All questions that follow relate to the care you would give this particular patient. Think about the patient's first consultation with you.

Patient: Mrs Jones, 58-year-old Prison Officer

History: First presentation of gradually worsening bilateral knee pain (right worse than left) over 2 years
No history of trauma
Pain always present when walking and at rest, worst when climbing stairs. No night pain.
Managing activities of daily living. Difficulty gardening.
Stopped going to gym – thinks was making pain worse
Only treatment tried is Ibuprofen once or twice when pain "really bad" – no benefit.
Came today finding work increasingly difficult due to the stairs
Usually well – no comorbidities

Medication: Nil

Examination: Body Mass Index 33
Knees – bilaterally no effusions. Joint tenderness upon palpation. Bilateral coarse crepitations. Slightly reduced flexion of the right knee.
Hips – no abnormality detected

What diagnosis would you make at this point?

Using the words you would use with the patient, briefly state how you would describe your diagnosis to the patient

The patient's symptoms are:

- ◯ Very severe
- ◯ Severe
- ◯ Moderate
- ◯ Mild
- ◯ Very mild

It is most likely that this patient's symptoms result from knee damage that is:

- ◯ Very severe
- ◯ Severe
- ◯ Moderate
- ◯ Mild
- ◯ Very mild

Using the words you would use with the patient, briefly describe what the future is likely to hold with regards to her knee problem

What investigation(s)/assessment(s) would you do/order for this patient at this point and for what reason? Please indicate the reason for choosing this investigation (tick all that apply)

	I wouldn't undertake this investigation	Reassure patient	To meet referral criteria	Confirm diagnosis	Inform treatment	Rule out other diagnoses	Inform prognosis
Blood tests	☐	☐	☐	☐	☐	☐	☐
Oxford knee scores	☐	☐	☐	☐	☐	☐	☐
Knee x-ray	☐	☐	☐	☐	☐	☐	☐
Other	☐	☐	☐	☐	☐	☐	☐

Other - please state

At this consultation, what approaches would you use, or suggest, to manage this patient? (please tick all that apply)

- ☐ Ice
- ☐ Heat
- ☐ Acupuncture
- ☐ Rest
- ☐ Weight loss
- ☐ None
- ☐ Keep active
- ☐ Provision of walking stick(s)
- ☐ Advice on footwear
- ☐ Exercise
- ☐ Bed rest
- ☐ Transcutaneous electrical nerve stimulation
- ☐ Weak opioids (e.g. codeine)
- ☐ COX II inhibitor
- ☐ Antidepressants
- ☐ Injection of steroids
- ☐ Oral non-selective NSAIDs (e.g. Ibuprofen)
- ☐ Topical NSAID
- ☐ Paracetamol
- ☐ Glucosamine / chondroitin
- ☐ Topical capsaicin
- ☐ Strong opioids (e.g. morphine, Tramadol)
- ☐ Other

Other (please state)

If you ticked "exercise" as an approach to manage the patient please answer this question. If not, please skip to the next question.

There are a variety of approaches that can be used to manage chronic knee pain in general practice including i) general exercises or increasing physical activity; ii) local knee or quadriceps strengthening exercises and iii) follow up patient to check to see if she is undertaking exercise on a regular basis.

i) GENERAL EXERCISES OR INCREASING PHYSICAL ACTIVITY

If you would use this strategy, please give details about what you would actually do (please tick any that apply)

- [ ] Give a leaflet
- [ ] Refer
- [ ] Suggest general exercises

Please state type of exercise

Please give details of anything else you would actually do

If you would not use the strategy but would like to, please tell us what prevents you (please tick any that apply)

- [ ] Insufficient expertise
- [ ] Insufficient time
- [ ] Other

If other, please state what other reasons prevent you (e.g. patient factors, access difficulties, uncertainty of benefit etc)

If you ticked "exercise" as an approach to manage the patient please answer this question. If not, please skip to the next question.

There are a variety of approaches that can be used to manage chronic knee pain in general practice including i) general exercises or increasing physical activity; ii) local knee or quadriceps strengthening exercises and iii) follow up patient to check to see if she is undertaking exercise on a regular basis.

ii) LOCAL KNEE OR QUADRICEPS STRENGTHENING EXERCISES

If you would use this strategy, please give details about what you would actually do (please tick any that apply)

- [ ] Demonstrate specific exercises
- [ ] Give a leaflet
- [ ] Refer
- [ ] Other

If other, please state what actions you would do

If you would not use the strategy but would like to, please tell us what prevents you (please tick any that apply)

- [ ] Insufficient expertise
- [ ] Insufficient time
- [ ] Other

If other, please state what other reasons prevent you (e.g. patient factors, access difficulties, uncertainty of benefit etc)

If you ticked "exercise" as an approach to manage the patient please answer this question. If not, please skip to the next question.

There are a variety of approaches that can be used to manage chronic knee pain in general practice including i) general exercises or increasing physical activity; ii) local knee or quadriceps strengthening exercises and iii) follow up patient to check to see if she is undertaking exercise on a regular basis.

iii) FOLLOW UP PATIENT TO CHECK TO SEE IF SHE IS UNDERTAKING EXERCISE ON A REGULAR BASIS

If you would use this strategy, please give details about what you would actually do (please tick any that apply)

- [ ] Planned follow-up
- [ ] Opportunistic follow-up
- [ ] Other

If other, please state what actions you would do

IF PLANNED FOLLOW UP: When

Please define number of days/weeks/months

IF PLANNED FOLLOW UP: How

- ◯ Face to face
- ◯ Via telephone

IF PLANNED FOLLOW UP: With whom

- ◯ Yourself
- ◯ Another professional or service

Another professional or service - please state

IF OPPORTUNISTIC FOLLOW UP: When

- ◯ If patient fails to improve
- ◯ Check when patient is next seen with this or any problem

If you would not use the strategy but would like to, please tell us what prevents you (please tick any that apply)

- [ ] Insufficient expertise
- [ ] Insufficient time
- [ ] Other

If other, please state what other reasons prevent you (e.g. patient factors, access difficulties, uncertainty of benefit etc)

Would you refer the patient to see someone else, either in the primary or community team or into secondary care, at this point?

- ◯ Yes
- ◯ No

If yes, to whom would you refer her?

Do you usually provide written information for patients in this situation?

- ◯ Yes
- ◯ No

If yes, please state the source of your written information

- ☐ Patient.co.uk or Emis Mentor
- ☐ Arthritis Research UK (previously known as ARC) or Arthritis Care
- ☐ Other

Other, please state

If you would provide written information, it would be very helpful to see a copy by returning it in the freepost envelope provided (please write on your unique survey ID) or by providing us with the link for any online information you access.

We are interested in your clinical opinion about patients aged 45 years and over with chronic knee pain. In this age group chronic knee pain is almost always due to knee osteoarthritis. Please answer all of the following questions using the definition of chronic knee pain as follows: knee pain and associated symptoms that have been present for more than 3 months not resulting from a fracture, infection, systemic rheumatological problem, metastases or surgery.

Section 3: Chronic knee pain in general practice

How much have you heard about or read the guideline published by NICE in 2008 for the care and management of osteoarthritis in adults?

- ◯ I have never heard about or read it
- ◯ I have heard of it but not seen it
- ◯ I have seen it but not read it
- ◯ I have read the full guideline and/or summary
- ◯ I have read and consider the guideline when planning management

Please consider your role in managing patients aged over 45 years old with chronic knee pain. Please indicate the extent to which you agree or disagree with the statements.

	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
It is part of my job to manage people with chronic knee pain	◯	◯	◯	◯	◯
I have enough time to manage patients with chronic knee pain	◯	◯	◯	◯	◯
Managing patients with chronic knee pain is a priority for me	◯	◯	◯	◯	◯
Managing patients with chronic knee pain is of clinical interest to me	◯	◯	◯	◯	◯
It is part of my job to reassure patients about the safety of exercise for chronic knee pain	◯	◯	◯	◯	◯
It is part of my job to provide patients with chronic knee pain with a written management plan	◯	◯	◯	◯	◯

Which statement best describes your role in including exercise in the management plan of a patient with chronic knee pain?

- ◯ I have no role in including exercise in the management
- ◯ I inform patients that exercise is a management option
- ◯ I advise patients to use exercise to manage their knee pain
- ◯ I recommend the types of exercise patients could use
- ◯ I give information on the type, frequency and duration of specific exercises

We are interested to hear about your experiences of barriers which might prevent the use of exercise in your management of chronic knee pain. Please tick all of the barriers that you have experienced

- ☐ Insufficient time in consultations
- ☐ Patients prefer other management options
- ☐ Insufficient expertise to give detailed information
- ☐ My GP colleagues do not use or value exercise
- ☐ Difficulty accessing physiotherapy
- ☐ Uncertainty about the most appropriate type of exercise
- ☐ Uncertainty about the effects of exercise
- ☐ Uncertainty about the safety of exercise
- ☐ Other

Other (please state)

Section 4: Your views about chronic knee pain

Below is a list of possible causes for a patient developing chronic knee pain. Please indicate the extent to which you agree or disagree with these causes.

	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
Hereditary/runs in the family	◯	◯	◯	◯	◯
Being overweight/obese	◯	◯	◯	◯	◯
A person's own mental attitude e.g. thinking about life negatively	◯	◯	◯	◯	◯
A person's emotional state e.g. feeling down, anxious	◯	◯	◯	◯	◯
Ageing	◯	◯	◯	◯	◯
Accident or injury	◯	◯	◯	◯	◯
Manual work	◯	◯	◯	◯	◯
Sport	◯	◯	◯	◯	◯
Osteoarthritis	◯	◯	◯	◯	◯
Changes consistent with osteoarthritis seen on x-ray	◯	◯	◯	◯	◯

When completing the following questions, please consider patients aged over 45 years old with chronic knee pain. Please indicate the extent to which you agree or disagree with the statements given

	Totally disagree	Largely disagree	Disagree to some extent	Agree to some extent	Largely agree	Totally agree
Mental stress can cause chronic knee pain even in the absence of tissue damage	◯	◯	◯	◯	◯	◯
The cause of chronic knee pain is unknown	◯	◯	◯	◯	◯	◯
Pain is a nociceptive stimulus, indicating tissue damage	◯	◯	◯	◯	◯	◯
A patient suffering from severe chronic knee pain will benefit from physical exercise	◯	◯	◯	◯	◯	◯
Functional limitations associated with chronic knee pain are the result of psychosocial factors	◯	◯	◯	◯	◯	◯
Patients with chronic knee pain should preferably practice only pain free movements	◯	◯	◯	◯	◯	◯
Therapy may have been successful even if pain remains	◯	◯	◯	◯	◯	◯
Chronic knee pain indicates the presence of organic injury	◯	◯	◯	◯	◯	◯
If chronic knee pain increases in severity, I immediately adjust the intensity of my treatment accordingly	◯	◯	◯	◯	◯	◯
If therapy does not result in a reduction in chronic knee pain, there is a high risk of severe restrictions in the long term	◯	◯	◯	◯	◯	◯
Pain reduction is a precondition for the restoration of normal functioning	◯	◯	◯	◯	◯	◯
Increased pain indicates new tissue damage or the spread of existing damage	◯	◯	◯	◯	◯	◯
There is no effective treatment to eliminate chronic knee pain	◯	◯	◯	◯	◯	◯
Even if the pain has worsened, the intensity of the next treatment can be increased	◯	◯	◯	◯	◯	◯
If patients complain of pain during exercise, I worry that damage is being caused	◯	◯	◯	◯	◯	◯
The severity of tissue damage determines the level of pain	◯	◯	◯	◯	◯	◯
Learning to cope with stress promotes recovery from chronic knee pain	◯	◯	◯	◯	◯	◯
Exercises that may be knee straining should not be avoided	◯	◯	◯	◯	◯	◯
In the long run, patients with chronic knee pain have a higher risk of developing severe functional impairments	◯	◯	◯	◯	◯	◯

Section 5: Your views about the role of exercise in treating chronic knee p...

We are interested in your views about the role of exercise in the treatment of chronic knee pain in patients over 45 years old. Please indicate the extent to which you agree or disagree with the statements given

	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
GPs should prescribe quadriceps strengthening exercises to every patient with chronic knee pain	◯	◯	◯	◯	◯
GPs should prescribe general exercise, for example, walking or swimming, for every patient with chronic knee pain	◯	◯	◯	◯	◯
Knee problems are improved by quadriceps strengthening exercises	◯	◯	◯	◯	◯
Knee problems are improved by general exercise, for example walking or swimming	◯	◯	◯	◯	◯
Quadriceps strengthening exercises for the knee are safe for everybody to do	◯	◯	◯	◯	◯
General exercise, for example walking or swimming is safe for everybody to do	◯	◯	◯	◯	◯
Exercise for chronic knee pain is most beneficial when it is tailored to meet individual patient needs	◯	◯	◯	◯	◯
A standard set of exercises is sufficient for every patient with chronic knee problems	◯	◯	◯	◯	◯
GPs should educate chronic knee pain patients about how to change their lifestyle for the better	◯	◯	◯	◯	◯
It is important that people with chronic knee pain increase their overall activity levels	◯	◯	◯	◯	◯
How well a patient complies with their exercise programme determines how effective it will be	◯	◯	◯	◯	◯
GPs should follow up patients to monitor extent of continuation of exercises	◯	◯	◯	◯	◯
It is the patient's own responsibility to continue doing their exercise programme	◯	◯	◯	◯	◯
Exercise is effective for patients if an x-ray shows severe knee osteoarthritis	◯	◯	◯	◯	◯
Exercise works just as well for everybody, regardless of the amount of pain they have	◯	◯	◯	◯	◯
Increasing the strength of the muscles around the knee stops the knee problem getting worse	◯	◯	◯	◯	◯
Increasing overall activity levels stops the knee problem getting worse	◯	◯	◯	◯	◯
Exercise for chronic knee pain is more effectively provided by physiotherapists than GPs	◯	◯	◯	◯	◯
Time constraints prevent GPs from providing advice on individual exercises for chronic knee pain	◯	◯	◯	◯	◯
Exercise for chronic knee pain should preferably be used after drug treatment has been tried	◯	◯	◯	◯	◯
Exercise for chronic knee pain would be used more frequently if access to physiotherapy was easier	◯	◯	◯	◯	◯

Would you be happy for us to contact you again in the future regarding this study?

◯ Yes

◯ No

If you answered yes to the question above please provide your name and contact details below (these details will be kept separately from your responses to the questionnaire)

Name:	
Address 1:	
Address 2:	
Town:	
State:	
Post Code:	
Email Address:	
Daytime Phone Number:	

You have completed the main questionnaire, thank you. We are interested in one final piece of information. Would you have completed and returned the paper version of the questionnaire if this electronic response option was not available?

◯ Yes

◯ No

You have reached the end of questionnaire. Thank you for taking the time to complete this questionnaire. Your time and participation is greatly appreciated.

If you have any questions about this questionnaire or the study in general, you can email Dr Elizabeth Cottrell at e.cottrell@keele.ac.uk

Completion and submission of this questionnaire will be interpreted as you providing your consent to participate in this study.

Appendix 23: Main survey approvals

Figure XXIII-A External peer review approval for the main survey

RESEARCH AND ENTERPRISE SERVICES

10 December 2013

Dr E Cottrell
Arthritis Research Primary Care Centre
David Weatherall Building
Keele University

Dear Elizabeth

Management of chronic knee pain: a questionnaire survey of GPs

As you know the above project was initially awarded a grade 2 but following assessment of your response to the issues raised the project now has received final approval from the Independent Peer Review Committee and can be submitted for ethical approval.

I am attaching a letter addressed to the Chair of the NHS REC along with the original peer review comments which you can enclose with your NHS REC application.

Management approval

You should arrange for all relevant NHS care organisations to be notified that the research will be taking place, and provide a copy of the REC application, the protocol and this letter.

All researchers and research collaborators who will be participating in the research must obtain management approval from the relevant care organisation before commencing any research procedures. Where a substantive contract is not held with the care organisation, it may be necessary for an honorary contract to be issued before approval for the research can be given.

Clinical trial of a medicinal product

Please remember that, if your project is a clinical trial of a medicinal product, MHRA approval is required. You must submit a request for a clinical trial authorisation under the Medicines for Human Use (Clinical Trials) Regulations 2004. Further details can be found at http://www.mhra.gov.uk/home/groups/l-unit1/documents/websiteresources/con2022633.pdf
If you have any queries, please do not hesitate to contact Nicola Leighton on 01782 733306.

Yours sincerely

pp N. Leighton

Professor A A Fryer
Chair – Independent Peer Review Committee

Enc

CC West Midlands CLRN

Keele University

RESEARCH AND ENTERPRISE SERVICES

10 December 2013

Chair
NHS Research Ethics Committee

Dear Sir/Madam

Investigator : Dr Elizabeth Cottrell

Name of study : Management of chronic knee pain: a questionnaire survey of GPs

Please find attached the peer review of the above project.

The project was initially awarded a grade 2 and the applicant was asked to address the points raised by the reviewer which included:-

- Addition of sentence to justify larger sample size
- More information regarding the use of questionnaires as a research methodology
- Consideration to the practical issues relating to questionnaires

We have informed the applicant that although this project has been deemed appropriate based on scientific merit, they wish to incorporate the reviewer's constructive comments to strengthen their protocol.

The Independent Peer Review Committee are satisfied that the issues raised have been answered and that the project can now be awarded a grade 1 and therefore can proceed for ethical review without any revision.

We have also stressed to the applicant that the Independent Peer Review Committee is NOT linked to or a Sub-Committee of the Local Research Ethics Committee and that you may identify ethical issues of your own.

If you have any queries, please do not hesitate to contact Hannah Reidy on 01782 733588.

Yours sincerely

pp N. Leighton
Professor AA Fryer
Chair – Independent Peer Review Committee

Enc

Figure XXIII-B Ethical approval for main survey

Keele University

RESEARCH AND ENTERPRISE SERVICES

9th December 2013

Elizabeth Cottrell
Arthritis Research UK Primary Care Centre
Keele University

Dear Elizabeth,

Re: GPs attitudes, beliefs and behaviours regarding exercise for chronic knee pain: a national cross-sectional questionnaire survey

Thank you for submitting your revised application for review. I am pleased to inform you that your application has been approved by the Ethics Review Panel. The following documents have been reviewed and approved by the panel as follows:

Document	Version	Date
Summary of Proposal	1	18/10/13
Letter(s) of Invitation	1	18/10/13
Reminder Postcard	1	18/10/13
Follow Up Letter	1	18/10/13
Information Sheets	Combined with invitation	
Questionnaire – paper version	1	18/10/13
Questionnaire – electronic version	2	08/11/13
Study Flowchart	1	18/10/13

If the fieldwork goes beyond the date stated in your application, you must notify the Ethical Review Panel via the ERP administrator at uso.erps@keele.ac.uk stating ERP2 in the subject line of the e-mail. If there are any other amendments to your study you must submit an 'application to amend study' form to the ERP administrator stating ERP2 in the subject line of the e-mail. This form is available via http://www.keele.ac.uk/researchsupport/researchethics/

If you have any queries, please do not hesitate to contact me via the ERP administrator on uso.erps@keele.ac.uk stating ERP2 in the subject line of the e-mail.

Yours sincerely

Dr Bernadette Bartlam
Chair – Ethical Review Panel

CC RI Manager
Supervisor

Research and Enterprise Services, Keele University, Staffordshire, ST5 5BG, UK
Telephone: + 44 (0)1782 734466 Fax: + 44 (0)1782 733740

Figure XXIII-C Ethical approval for first amendment for main survey

Keele University

RESEARCH AND ENTERPRISE SERVICES

11th December 2013

Elizabeth Cottrell
Arthritis Research UK Primary Care Centre
Primary Care Services
Keele University
ST5 5BG

Dear Elizabeth,

Re: 'GP's attitudes, beliefs and behaviours regarding exercise for chronic knee pain: a national cross-sectional questionnaire survey'

Thank you for submitting your application to amend study for review.

The following documents have been reviewed and approved by the panel as follows:

Document	Version	Date
Management of CKP – Questionnaire Electronic Version	3	05/12/13

If the fieldwork goes beyond the date stated in your application, you must notify the Ethical Review Panel via the ERP administrator at uso.erps@keele.ac.uk stating ERP2 in the subject line of the e-mail.

If there are any further amendments to your study you must submit an 'application to amend study' form to the ERP administrator stating ERP2 in the subject line of the e-mail. This form is available via http://www.keele.ac.uk/researchsupport/researchethics/

If you have any queries, please do not hesitate to contact me via the ERP administrator on uso.erps@keele.ac.uk stating ERP2 in the subject line of the e-mail.

Yours sincerely

Dr Bernadette Bartlam
Chair – Ethical Review Panel

CC RI Manager
Supervisor

Research and Enterprise Services, Keele University, Staffordshire, ST5 5BG, UK
Telephone: + 44 (0)1782 734466 Fax: + 44 (0)1782 733740

Figure XXIII-D Ethical approval for final amendment for main survey

Keele University

RESEARCH AND ENTERPRISE SERVICES

22nd April 2014

Elizabeth Cottrell
Arthritis Research UK Primary Care Centre
Keele University

Dear Elizabeth,

Re: GP attitudes, beliefs and behaviours regarding exercise for chronic knee pain: a national cross-sectional questionnaire survey

Thank you for submitting your application to amend study for review.

I am pleased to inform you that your application has been approved by the Ethics Review Panel.

The following documents have been reviewed and approved by the panel as follows:

Document	Version	Date
Management of CKP – Summarised Project Proposal	2	11/04/14

If the fieldwork goes beyond the date stated in your application you must notify the Ethical Review Panel via the ERP administrator at uso.erps@keele.ac.uk stating ERP2 in the subject line of the e-mail.

If there are any other amendments to your study you must submit an 'application to amend study' form to the ERP administrator stating ERP1 in the subject line of the e-mail. This form is available via http://www.keele.ac.uk/researchsupport/researchethics/

If you have any queries, please do not hesitate to contact me via the ERP administrator on uso.erps@keele.ac.uk stating ERP2 in the subject line of the e-mail.

Yours sincerely

Dr Bernadette Bartlam
Chair – Ethical Review Panel

CC RI Manager

Research and Enterprise Services, Keele University, Staffordshire, ST5 5BG, UK
Telephone: + 44 (0)1782 734466 Fax: + 44 (0)1782 733740

Figure XXIII-E R&D approval for main survey

NHS
National Institute for Health Research

West Midlands North CLRN Primary Care RM&G Business Support Service
(Hosted by North Staffordshire Combined Healthcare NHS Trust)

Correspondence to:
West Midlands North Comprehensive Local Research Network
Room 7.11
Innovation Centre 2
Keele University Science and Business Park
Keele
Staffordshire
ST5 5NH

Contact telephone no: 01902 441843
Email: sch-tr.wmnclrn@nhs.net

Date:	13 January 2014 Amendment to orginal letter dated 09 January 2014
Address:	Arthritis Research UK Primary Care Centre Primary Care Services Keele University ST5 5BG

Dear Dr Edward Roddy

RE: LETTER OF ASSURANCE FOR RESEARCH SITES

Study Title:	GP's attitudes, beliefs and behaviours regarding exercise for chronic knee pain: a national cross-sectional questionnaire survey.
IRAS Project Number:	133660
UKCRN Portfolio Number:	Tbc
REC Reference:	n/a Research limited to involvement of staff as participants (no involvement of patients/service users as participants)
Chief Investigator:	Dr Edward Roddy
Sponsor:	Keele University

Proposed Research Location(s)	Proposed local study end date
GP Practices within the West Midlands North CLRN region.	31 March 2014

Thank you for submitting your application for the above study. Your application has been reviewed by the West Midlands North CLRN Primary Care RM&G Business Support Service. The governance review is commensurate with nationally agreed research governance

criteria[1] and aligns with the requirements set out in the NHS Research Governance Framework.

This letter confirms that this study application has undergone research governance review and has satisfied the governance criteria for Research site..

This is on the understanding that:

- *All sites are notified to WMN CLRN on their agreement to participate*
- *Any Letters of Access or Honorary Research Contracts that are required are obtained before the researcher in question accesses the relevant patients/site*

A copy of the Research Governance Report is attached, which lists the study application documents and the National Institute for Health Research Coordinated System for gaining NHS Permission (NIHR CSP) governance review criteria applicable to this study. A copy of this NHS Assurance Letter and the Research Governance Report **must be** presented to Independent Contractors to provide them with assurance that satisfactory review of the study has been undertaken.

This assurance is issued on the basis that the study will be conducted in accordance with the correct version of the Study Protocol and supporting documents. As of the date of this Assurance Letter, we understand the following documents to be the current versions:

Document	Version Number	Date
Approved by Keele University Research Enterprise Services Ethics Review Panel	Original Amendment	09 December 2013 11 December 2013
Summary of Proposal	1	18 October 2013
Letter(s) of Invitation	1	18 October 2013
Reminder Postcard	1	18 October 2013
Follow Up Letter	1	18 October 2013
Questionnaire – paper version	1	18 October 2013
Study Flowchart	1	18 October 2013
Management of CKP – Questionnaire Electronic Version	3	05 December 2013

In order to ensure continuous assurance, the Chief Investigator and Sponsor are responsible for promptly notifying any of the points below to the West Midlands North Primary Care RM&G Business Support Service:

- Any amendment to your study
- Changes to the start and end date of the study
- Changes to the recruitment target or timeline (study wide or local)
- Changes in personnel/members of the research team
- Any requirements for Letters of Access or Honorary Research Contracts that have not previously been notified to the Business Support Service
- All Serious Adverse Events relevant to the conduct of the study in progress within the primary care providers in Staffordshire, Shropshire and Wolverhampton
- Any deviations from the protocol or protocol breaches including any urgent safety measures that are required to be taken in order to protect research participants against any immediate hazard to their health or safety

[1] National Institute for Health Research Coordinated System for Gaining NHS Permission (NIHR CSP) Operating Manual

- All incidents[2] or complaints in relation to the conduct of the research project at Primary Care Providers in Staffordshire, Shropshire and Wolverhampton
- Notification of the study conclusion and / or termination of the study

Please note that this letter does not place any obligations on Primary Care Providers to participate in this study. Confirmation is required from each Provider of their willingness to take part in the study.

The local Primary Care Research Network (PCRN CE (North Spoke)) will use the attached 'Acknowledgement of Assurance and Confirmation of Participation' document to record which local Providers agree to participate in the study.

If you have any queries regarding this study, please contact us on the telephone number above. The IRAS project ID is the reference number for this study and should be quoted in all communication and correspondence.

Yours sincerely

T. M. Adlam

West Midlands North CLRN
Primary Care RM&G Business Support Service

Copy to:

Principal Investigator: Dr Elizabeth Cottrell
Supervisor Study Co-ordinator: Ms Jackie Gray
PCRN CE (North Spoke) contact: Gail White

[2] An incident is defined as any event or circumstance that could have, or did, lead to harm, loss or damage and includes loss of data, confidentiality breaches, harm to researchers or staff or damage to property.

Appendix 24: Cover letter for initial main survey mailing

Dr Elizabeth Cottrell
Arthritis Research UK Primary Care Centre
Keele University
Staffordshire
ST5 5BG

e.cottrell@keele.ac.uk

Keele University

DATE

Dear

Management of chronic knee pain: a national questionnaire survey of GPs

We are inviting you to participate in a research study about chronic knee pain as you have been identified from a random national sample of General Practitioners. We are based at the Arthritis Research UK Primary Care Centre at Keele University and the study is funded by Arthritis Research UK. We have gained ethical approval for this research from the Keele University Ethical Review Panel.

Before you decide whether you would like to participate in the study please read the information overleaf and contact us if you have any further questions. The results of this study will be disseminated through publications and/or presentations at conferences. If you would like a copy of the results sent electronically to you please email Dr Elizabeth Cottrell at e.cottrell@keele.ac.uk.

What are we asking from you? We ask that you complete the enclosed questionnaire. There are no right or wrong answers. Please put your own opinions and thoughts without reference to other material. A pilot of this questionnaire indicated that completion should take no more than **20 minutes**. Return of the completed questionnaire is accepted as your consent to participate in the research. You are free to withdraw from the study at any time, even after returning the questionnaire.

Study deadline: Please return the questionnaire in the pre-paid envelope enclosed by ****date 8 weeks after start date****. Alternatively you can reply online by visiting http://www.XXXXXXXXX and inserting your unique survey ID number (found at the end of this letter).

Many thanks for your time and participation in this study

Dr Elizabeth Cottrell
NIHR Academic Clinical Fellow, GP Specialty Trainee

Dr Edward Roddy
Clinical Senior Lecturer, Consultant Rheumatologist

Prof Nadine Foster
NIHR Professor of Musculoskeletal Health in Primary Care, Physiotherapist

Ms Trishna Rathod
Research Assistant in Biostatistics

Dr Mark Porcheret
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Background to the study: Chronic knee pain is common among individuals aged over 45 years and thus commonly presents to General Practitioners

Aims of the study: This study aims to identify the current attitudes, beliefs and behaviours of General Practitioners regarding, and their perceived roles in, the management of chronic knee pain. This is part of a larger research programme that is being undertaken by the research centre that aims to inform the development of interventions to support and improve the management of patients with chronic knee pain in primary care.

Confidentiality: All information you provide us with will be treated in the **strictest confidence** and used only for the purpose of this research study. Names and addresses are required to administer the study and appropriate reminders, but this information will be held separately from the questionnaire data, which will be analysed **anonymously**. If you provide us with contact details for further research work in this area, your details will be removed from the questionnaire once we receive it.

What if there is a problem? If you have a concern about any aspect of this study, you may wish to speak to the researchers who will do their best to answer your questions. You can contact Dr Elizabeth Cottrell on 01782 734683 or email e.cottrell@keele.ac.uk. Alternatively, if you do not wish to contact the researchers you may contact Nicola Leighton, Research Governance Officer on 01782 733306 or n.leighton@keele.ac.uk. If you remain unhappy about the research and/or wish to raise a complaint about any aspect of the way that you have been approached or treated during the course of the study please write to Nicola Leighton who is the University's contact for complaints regarding research by email or telephone, as above, or at the following address: Nicola Leighton, Research Governance Officer, Research & Enterprise Services, Dorothy Hodgkin Building, Keele University, ST5 5BG

Contact for further information. If you require any further information regarding this study please contact Dr Elizabeth Cottrell by email on e.cottrell@keele.ac.uk

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Your involvement is **voluntary** so you can choose not to take part if you so wish. If you do not wish to take part we would be grateful if you could still return your questionnaire. If you **do not wish** to participate in the study, to improve the quality of our data we would be grateful if you could please supply the following information by **returning the completed answers below with your blank questionnaire** in the pre-paid envelope enclosed:

We are interested to know the **one** reason below that most closely matches your decision **not to** participate:

Too little time	☐	I don't understand the questions	☐
Subject not relevant to me	☐	Questionnaire too long	☐
Subject of no interest to me	☐		

Other (please state) _____

To improve the quality of our data, we would be grateful for the following information about you:

What year did you qualify as a GP? _____		Are you:	Male? ☐ Female? ☐
How many GPs work in your practice? _____		Is your practice:	Urban? ☐ Semi-rural? ☐ Rural? ☐

Unique survey ID

Appendix 25: Postcard for first reminder mailing for main survey

Unique survey ID:

Management of Chronic Knee Pain Study

Reminder to participate

Keele University

We recently sent you a letter, questionnaire and FREEPOST envelope inviting you to participate in our *Management of Chronic Knee Pain* study. The aim of this study is to describe the attitudes, beliefs and behaviours of GPs in the UK regarding the management of chronic knee pain in adults over 45 years old. This study will inform future research and the development of interventions to improve the management of chronic knee pain in primary care. You have been chosen at random from a national database of GPs, however your participation is entirely voluntary.

If you **do wish** to participate please complete and return the questionnaire. Alternatively, you can reply online by visiting https://www.surveymonkey.com/s/Management_CKP and inserting your unique survey ID number (found at the top of this card). If you did not receive the questionnaire or have lost it please contact Dr Elizabeth Cottrell on 01782 734683 or email e.cottrell@keele.ac.uk.

If you **do not** wish to participate please tick this box and return this postcard to us ☐

We are interested to know the **one** reason below that most closely matches your decision not to participate:

Too little time	☐	I don't understand the questions	☐
Subject not relevant to me	☐	Questionnaire too long	☐
Subject of no interest to me	☐		

Other (please state) _____

To improve the quality of our data, we would be grateful for the following information about you:

What year did you qualify as a GP? _____

How many GPs work in your practice? _____

Are you: Male ☐ Female ☐

Is your practice: Urban ☐ Semi-rural ☐ Rural ☐

Management of CKP – Reminder Postcard Version 1.0 18/10/2013

Appendix 26: Cover letter for second main survey reminder mailing

Dr Elizabeth Cottrell
Arthritis Research UK Primary Care Centre
Keele University
Staffordshire
ST5 5BG

e.cottrell@keele.ac.uk

Keele University

DATE

Dear

Management of chronic knee pain: a national questionnaire survey of GPs

We recently invited you to participate in a study about chronic knee pain as you were identified from a random national sample of General Practitioners. We are based at the Arthritis Research UK Primary Care Centre at Keele University and the study is funded by Arthritis Research UK. We have gained ethical approval for this research from the Keele University Ethical Review Panel. We have not yet received a response from you but are still very interested to hear from you. We have therefore enclosed another copy of the questionnaire and would be grateful if you could complete this. If you have returned a questionnaire in the last few days we apologise for troubling you again.

Before you decide whether you would like to participate in the study please read the information overleaf and contact us if you have any further questions. The results of this study will be disseminated through publications and/or presentations at conferences. If you would like a copy of the results sent electronically to you please email Dr Elizabeth Cottrell at e.cottrell@keele.ac.uk.

What are we asking from you? We ask that you complete the enclosed questionnaire. There are no right or wrong answers. Please put your own opinions and thoughts without reference to other material. A pilot of this questionnaire indicated that completion should take no more than **20 minutes**. Return of the completed questionnaire is accepted as your consent to participate in the research. You are free to withdraw from the study at any time, even after returning the questionnaire.

Study deadline: Please return the questionnaire in the pre-paid envelope enclosed by ****date 8 weeks after start date****. Alternatively you can reply online by visiting http://www.XXXXXXXXX and inserting your unique survey ID number (found at the end of this letter).

Many thanks for your time and participation in this study

Dr Elizabeth Cottrell
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Background to the study: Chronic knee pain is common among individuals aged over 45 years and thus commonly presents to General Practitioners

Aims of the study: This study aims to identify the current attitudes, beliefs and behaviours of General Practitioners regarding, and their perceived roles in, the management of chronic knee pain. This is part of a larger research programme that is being undertaken by the research centre that aims to inform the development of interventions to support and improve the management of patients with chronic knee pain in primary care.

Confidentiality: All information you provide us with will be treated in the **strictest confidence** and used only for the purpose of this research study. Names and addresses are required to administer the study and appropriate reminders, but this information will be held separately from the questionnaire data, which will be analysed **anonymously**. If you provide us with contact details for further research work in this area, your details will be removed from the questionnaire once we receive it.

What if there is a problem? If you have a concern about any aspect of this study, you may wish to speak to the researchers who will do their best to answer your questions. You can contact Dr Elizabeth Cottrell on 01782 734683 or email e.cottrell@keele.ac.uk. Alternatively, if you do not wish to contact the researchers you may contact Nicola Leighton, Research Governance Officer on 01782 733306 or n.leighton@keele.ac.uk. If you remain unhappy about the research and/or wish to raise a complaint about any aspect of the way that you have been approached or treated during the course of the study please write to Nicola Leighton who is the University's contact for complaints regarding research by email or telephone, as above, or at the following address: Nicola Leighton, Research Governance Officer, Research & Enterprise Services, Dorothy Hodgkin Building, Keele University, ST5 5BG

Contact for further information. If you require any further information regarding this study please contact Dr Elizabeth Cottrell by email on e.cottrell@keele.ac.uk

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We are interested to know the **one** reason below that most closely matches your decision **not to** participate:

Too little time	☐	I don't understand the questions	☐
Subject not relevant to me	☐	Questionnaire too long	☐
Subject of no interest to me	☐		

Other (please state) _____

To improve the quality of our data, we would be grateful for the following information about you:

What year did you qualify as a GP? _____		Are you:	Male? ☐
			Female? ☐
How many GPs work in your practice? _____		Is your practice:	Urban? ☐
			Semi-rural? ☐
			Rural? ☐

Unique survey ID

Appendix 27: Questionnaire free-text response coding

Coding initially followed the final coding from pilot questionnaires, however as new concepts emerged, the themes were redeveloped. Below is the final coding of the main study questionnaire, providing overarching themes and response codes/concepts included. The red text indicates the novel responses arising within the main survey for the individual codes.

Overarching theme	Response code (label)	In pilot coding	Free-text responses included within code
Diagnosis			
Medical label	diag_OA	✓	"Early arthritis", "degenerative changes", "degenerative joint disease" "degenerative changes to the knees", "primary osteoarthritis", "OA", "osteoarthritis", "osteoarthritis knee", "mild to moderate OA…PJ compartment", "patellorfemoral arthritis", "retropatella arthritis", "patella degeneration" "osteoarthropathy" "mild OA" "arthritis" "...cartilage degeneration"
Medical label	diag_cert_OA	✓	Indicators for OA associated with "presumed", "prob"/"probably" "probable", "possibly", "likely", "most likely", "provisionally", "may be indicative of", "suspected", "suspect" "Look elsewhere to see other markers of OA but think OA" need blood tests" " with/after x-ray"
Medical label	diag_CKP	✓	"chronic knee pain" "functional knee pain" "knee pain"
Medical label	diag_cert_CKP	✓	Indicator for CKP associated with "likely"
Medical label	diag_obesity	✓	"high BMI", "obesity", "overweight" "aggravated by weight" "knee pain 2ry to...weight" "exacerbated by weight"
Medical label	diag_PFJ	✓	"patellofemoral syndrome", "patellofemoral pain", "anterior knee pain", "retropatella" "Chondromalacia patellae" "patellar tendinopathy"
Medical label	diag_tendonit	×	"quadriceps tendonitis" "tendonitis" "patella tendonitis"
Medical label	diag_cartil	×	"meniscal injury", "meniscal tear" "meniscal degeneration" "meniscal bruising" "post torn degenerative meniscus tear" "Cartilage tear" "cartilage" "...cartilage degeneration" "meniscal bruising" "need to exclude…degenerative cartlidge" "no clear picture of meniscal damage but may be present" "???meniscal damage" "chondrocalcinosis"
Medical label	diag_ligament	×	"ligament knee pain", "ligament damage" "weak external ligaments"
Medical label	diag_inflamarth	×	"could be other form of arthritis e.g. RA" "inflammatory""gout" "...differentiate between OA + RA" ""need to exclude inflammatory arthritis" "Inflammatory/osteoarthritis"
Medical label	diag_inflam	×	"Inflammation of the knees - ?osteoarthritis"

Lay label	diag_WnT	✓	“wear and tear”, “possibly a bit of wear and tear”, “worn knees”, “possibly a bit of wear and tear”
Lay label	diag_WnR	×	“wear and tear and repair arthritis” “wear and repair”
Other	diag_other	✓	“maltracking patella”, “Functional knee pain - maltracking patella”, “mechanical knee pain”, “muscle wasting” “inactive” “exacerbated by…low exercise” “OA rt hip” “but why the creps? And why did I listen to his chest??” “No comment on quadriceps wasting” “possible mechanical component” “poor physical tone” “caution loss of muscle bulk (restricting exercise)” “Musculoskeletal joint disease” “Possible degenerative change with likely muscle wasting related to decreased use” “inactive”
No diagnosis	diag_none	✓	“none”, “I wouldn’t give a diagnosis at this stage” “knee pain, cause unclear.” “knee pain ?cause”, “knee pain looking for a cause” (if no response given at all, coded as missing)
Description of diagnosis			
Disease process	desc_diag_WnT (Wear and tear)	✓	“wear and tear” “wearing out”, “wearing of the joint”, “ "wear and tear" but actually needs to keep moving to lubricate the joint”, “showing lots of wear” “wear” “worn” “mechanical wearing” “knees worn down – shock absorbers worn out” “kneecaps are worn” “underneath the knee cap is worn away” “wear tear and flare” “loss of shock absorbers so bone wears on bone...” “lining of the knees is getting a bit worn...”
Disease process	desc_diag_notWnT (Acknowledged wear and tear not appropriate and/or accurate)	×	Use if the description uses ‘wear’ or ‘wear and tear’ but develops the description with why this is not appropriate/accurate. “This used to be called "wear and tear arthritis" but I don’t use that term because it suggests using it will cause more damage” “Many people think it is simply due to age or wear and tear but it is more complicated than that.” “traditionally called "wear and tear arthritis" though not strictly correct” “I would say wear and tear but NOT wear and tear (whoever said being a doctor was easy?)” “less likely due to wear and tear” “ in the past we called this "wear and tear" arthritis but now we are being encouraged to use "flare and repair" arthritis””I know this is no longer advised explanation but I can't stop myself -> wear and tear” “aka 'wear and tear' in laymans terms, however, wear, flare and repair is more accurate” “also called "wear and tear arthritis" though this is a bit of a misnomer”
Disease process	desc_diag_WnR (Wear (tear) and repair)	✓	“wear and repair”, “wear and tear/wear and repair” “cumulative small injuries and repair” “tear and repair” “Pain often a sign of knees trying to heal any damage to joints” “Bone cycle with new bone and reabsorption of old” “Osteoarthritis is often called "wear and tear" but it really represents problems with joint repair” “wear and tear in laymans terms however wear, flare and repair is more accurate” “the repeated minor damage that we all undergo daily is outstripping the body’s capacity for repair at least in this area!” “ constant state of wear and repair and sometimes if the repair process is a bit slow this gives pain” “as we age the body gets less efficient at repairing the stress to our joints from everyday activities” “more likely a problem with wear, tear and repair” “continually being worn and replaced + in them the balance is out causing more wear than replacement”

Disease process	desc_diag_arthrit (Arthritis or osteoarthritis)	✓	“osteoarthritis”, “Knee pain ?OA, ?STI, ?ortho”, “arthritic change”, “I am doing an x-ray to see if there is any osteoarthritic damage”, “x-ray will check for arthritic change” “degeneration” “degenerative process” “bony spurs” “osteophytes”
Disease process	desc_diag_notarth	×	“I do not use the dreaded words “arthritis” “telling people they have arthritis is disastrous”
Disease process	desc_diag_inflam (Inflammation)	✓	“Inflammation between knee cap and femur”, “inflammation of the joint covering and bone”, “inflammation to the internal surface of the joint”, “inflammation behind the knee cap” “the condition can flare up "inflammatory flare" causing increased pain” “some inflammation in the knee joint” “Inflammation of joints due to stresses and strains” “wear and tear leading to inflammation” “Some signs of inflammation in the joint” “Wear and tear with inflammation in the joint” “Inflammed joints”
Disease process	desc_diag_noinflamart (Not inflammatory arthritis)	×	Anything relating to it not being inflammatory arthritis,”…is the type which does not tend to make people ill otherwise” “it is not the same as inflammatory arthritis like rheumatoid arthritis…”“not the sort of arthritis that spreads” “I do not suspect Inflammatory arthritis” “not inflamed” “There is little or no inflammation” “discuss 'wear and tear' arthritis (vs rheumatoid/inflammatory types)” “form of arthritis "wear and tear" rather than inflammatory” “Arthritis is an inflammation of the joint which is not well understood” “Discuss different types of arthritis. Specify osteoarthritis” “is not the destructive type which causes wasting of hands” “osteoarthritis which is they type which does not tend to make people ill otherwise.” “but not the sort of arthritis that spreads”
Aetiology	desc_diag_age (Relationship with age)	✓	“due to ‘maturity’ of your knee”, “your knees are 58 years old”, “Joint surfaces become less smooth as we get older”, “compatible with her age”, “common problem as you get older” “as years go by” “they’ve been carrying her around for the past 58yrs” “from years of use” “over the years” “associated with….prolonged use” “over time” “aging changes in the knee” “normal aging of bones”
Aetiology	desc_diag_occ (Relationship with occupation)	✓	“the job make it feel worse but isn't the case”, “You have a job that requires considerable standing”, “you obviously have a physical job”, “due to job” “…come with…being on her feet a lot” “caused by hard work” “aggravated by occ..” “job is at risk”
Aetiology	desc_diag_life (Relationship with lifestyle factors)	×	“exacerbated by reduction in exercise” “exacerbated by….lifestyle” “ aggravated by certain activities” “in part due to… lifestyle” “relating to her activity levels” “Due to every day activity” “caused by…activity” “ “Not made worse by exercise” “due to usage”, “from general use” “manage it with lifestyle changes”, “needs lifestyle changes”
Aetiology	desc_diag_wt (Relationship with being overweight/obese)	✓	“your wt will aggrevate symptoms”, “possible related to weight”, “would benefit from weight loss”, “due to…weight”, “lose weight”, “strain by carrying extra weight” “not helped by ^BMI”
Aetiology	desc_diag_strain	✓	Item renamed as desc_diag_mechan and other mechanical causes added

Aetiology	desc_diag_mechan (Mechanical cause)	×	“the tendons @ the front are probably struggling to cope”“...reduced stability of the knees. There is an imbalance between strength and load as pain causes weakness”“the knee cap is not sitting in the grove in the thigh bone properly” “mechanical” “problem with mechanics of knee” Knee caps are grinding against the underlying bones as they are pulled to one side” “ Problem with mechanics of knee” “imbalance of muscles around knees causes maltracking” “strain by carrying extra weight”, “putting strain on your knees”, “weight loss to reduce the stress and strain on your knees” “soft tissues reaction to stress on the knee” “excess load” “the body gets less efficient at repairing the stress to our joints from every day activities” “related to physical stress” “Pain due to weakness of supporting structures of joint”
Aetiology	desc_diag_inherit (Hereditary)	×	“runs in families” “genetics” “inherited tendancy” “ inherited factors” “FH/genetic contributes”
Structures involved	desc_diag_muscle (Muscle affected)	✓	“imbalance of muscles around knees causes maltracking”, “pain due to…less muscle”, “muscle imbalance”, “weaker muscles”, “muscle strength reduce – exacerbating it”, "should exercise to strengthen muscles”, “I would suggest local muscle strengthening exercises”, “we can help by strengthening muscles” [not used if only ‘exercise’ mentioned] “can be improved with exercise to build muscles up”
Structures involved	desc_diag_cartil (Cartilage affected)	✓	“caused by wearing out of the smooth knee cartilage”, “decrease in cartilage lubricating joint” “cartilage thins” “possible tear in the R knee cartiledge” “...loss of gristle “cushions” “possibly some loss of cushioning protection” “ Reduced cartilage”
Structures involved	desc_diag_jtsurf (Joint surface affected)	✓	“joint surface rough…get pain/swelling due to friction of rough surfaces”, “Joint surfaces become less smooth as we get older” “bone grinding against bone” “roughness in the joint” “ends of the bone rubbing on each other” “joint becomes ragged and less padding so catches and rubs and causes pain” “...expose the underlying bone leading to extra knee fluid production and irritation of the nerves in the bone”,“roughening of the joints”, “joint becomes more uneven”, ”damage to...lining of joint”/ “lining of the knees is getting a bit worn...”
Structures involved	desc_diag_jtspace (Joint space affected)	✓	“reduction in joint space b/w knees” “narrowing of the knee joint”
Structures involved	desc_diag_Kcap (Knee cap affected)	✓	“Inflammation between knee cap and femur”, “Patella” “front compartment of knee”

Structures involved	desc_diag_tendon (Tendon affected)	×	"...due to irritation of the tendon at the front of the knee..." " tendon that supports knee cap weak"
Candidacy	desc_diag_treatable (Problem is treatable)	×	"should exercise to strengthen muscles", "I would suggest local muscle strengthening exercises", "we can help by strengthening muscles" [not used if only 'exercise' mentioned] "can be improved with exercise to build muscles up" "would benefit from weight loss", "lose weight" "easily treated" "joint pain for which there is effective treatment"] "need to focus on exercise" " this is an active process and there is effective treatment" "which can be managed by regular moderate exercise and weight loss with simple analgesia when required" "we could work together to improve it and make it bearable" "can be helped" "can improve this with exercise, analgesia and weight management" "can probably be managed with a suitable exercise/pain killer programme" " so should improve with treatment"
Candidacy	desc_diag_progress (Condition is inevitably progressive)	×	"Natural course is symptom progression. Try to manage it with painkillers and lifestyle changes until needs surgery" "degenerative and progressive condition which is usually managed rather than cured – terribly sorry" "Worse with time?" "gradual deterioration" "Slow progressive" "It is likely to progress over time"
Candidacy	Desc_diag_notprog	×	"doesn't necessarily get progressively worse"
Candidacy	desc_diag_extdam_min (Extent of underlying damage minimal)	✓ adapted	"Unlikely to be due to significant tissue damage", "mild", "mild to moderate", "unlikely severe problem" "a bit" "not serious", "Not found anything worrisome when examined her" "not dangerous" "your knee it isnt too bad"
Candidacy	desc_diag_extdam_sig (Extent of underlying damage significant)	×	"some badly damage to joints"
Candidacy	desc_diag_normalise (Problem normalised)	×	"common condition, chronic" "not uncommon""common problem" "common" "normal to develop it" "this often happens" "we all get it" " which is commoner as we get older" "very common" "is common in everyone over 50 and caused by normal use of a joint" "sadly this happens to us all" "such as we all get as we get older" "type of arthritis that we commonly see in people of your age who have led fit and active lives" "you know the type we see more often as we get older"
Candidacy	desc_diag_stage (Stage of the diagnosis)	✓	"early" "...pre-osteoarthritis (i.e. it will go onto OA if not attended to)"
Candidacy	desc_diag_functaffect (Diagnosis has functional impact)	×	"pictorially – thickening of the bones, affecting joint function", "not dangerous but interferes with your daily activities" " causing pain and reduced function/movement" " can impact a lot on function"

Uncertain	desc_diag_cert (Uncertainty over diagnosis given)	✓	"difficult to diagnose cause. Probably need to observe her response to therapy", "check for active disease", "subject to confirmation" "It may be that…"
Uncertain	desc_diag_needix (Investigation results needed before diagnosis given)	×	"we could look at the x-ray result", "may be…but I need to do some tests to see", "I am doing an x-ray to see if there is any osteoarthritic damage", "There may be arthritis present so have x-ray"," which an x-ray will confirm", "x-ray will check for arthritic change", "x-rays to look for loose bodies in joint" "does need further tests to confirm" " we need to make sure by MRI scan" "will do x'y & blood test and review you again" "X-ray to check." "we need to do some investigations to look at this further"
Supporting materials	desc_diag_supp_mat (Uses supporting materials to reinforce description)	×	"Print info sheet with picture" "I would give her an ARC leaflet on OA knees" "show a diagram of OA" "(with diagram)" "(using diagram)" "I might use a diagram" "I would demonstrate with a model" "Use model" "show model of knee to explain" " I usually explain with bone models in my room and google images" "I have a model knee so I explain how the patella works" "would demonstrate wear of cartilage using knee model"
Other	desc_diag_other_diag (Other diagnosis given)	✓	"Irritable knees", "supporting soft tissue no longer strong enough to support the joint" "...concern over...lungs" *[This is because some GPs interpreted 'crepitations' as referring to lungs rather than knees – on reflection "crepitus" would have been a better term but this confusion did not occur in the pilot]*
None	desc_diag_none (No diagnosis can be given at this stage)	✓	
Future			
Positive	Fut_Pos (Future may be positive	✓	Future positive: "Good"" "Reassure" "one off" "Be optimistic that as no significant damage outlook is good" "burns out" "good outlook" Condition/symptoms manageable: "The arthritis will always be there. We can generally control your discomfort"/"non-reversible but controllable" "it may stay the same…so we need to look at ways to help you manage better" "controllable degeneration of the joint" "can be helped" "things which can help reduce the speed that this happens" "can be managed and symptoms eased" Condition/symptoms will improve: "should be able to strengthen the knees with physio and relieve most of the pain", "The pain is likely to continue but should not remain as bad" "pain should go","symptoms are likely to gradually improve over time"
Negative	Fut_Neg (Future may be negative)	✓	"Can lead to pain and loss of function" , "Pain may become more frequent or more severe", "Could improve but likely some pain long term" Worsening of underlying condition: "The knee problem could get worse", "Likely to become worse with time", "May not worsen but often does gradually", "The knee will get worse with time but very slowly" "it could progress" "Continued gradual deterioration expected" "underlying condition only likely to worsen, although slowly"

Variable	Fut_variable (Future may be variable)	✓	Describes fluctuating symptoms waxing/waning, flares, relapse/remission, sometimes worse that others, “tear and repair”, “will trouble him from time to time” “likely to recur from time to time” “improvements likely, further flares likely”
Treatment	Fut_treatment (Treatments that might be required)	✓	Medication, Physio, Surgical options - “Can be improved with regular…paracetamol may need total knee replacement” “should be able to strengthen the knees with physio and relieve most of the pain” “advise re pain relief” there are treatments available to manage the condition, ranging from tablets to injections and surgery “Could end up in reconstruction arthroplasty” “sometimes people may need a joint replacement if symptoms get worse over the years” “knee replacement in the future is a distinct possibility” Consider analgesia may benefit from surgery in future “Analgesic, vit D, may need steroid injection intra-articular. Need to be followed up by rheumatologist or orthopaedic”
Dependent on patient	Fut_Dep_Pt (Future is dependent on the patient)	✓	Suggests can be changed/improved by weight loss, muscle strengthening, regular exercise, attitude of patient etc “depends on what you can do for yourself” “If she doesn’t lose weight – pain will persist” “Continuing pain unless you lose weight” “best to continue to use joint ‘if you don’t use it you lose it’” “Must keep moving”
Uncertain	fut_uncertain (Future uncertain)	×	Uncertain as cannot predict, describes multiple possible outcomes: some people get better some get worse “May improve but risk of further deterioration” “1/3 get worse, 1/3 stay the same, 1/3 get better” “ May stabilise or worsen in time” Uncertain at current time: Depends on investigations – “Wouldn't give this sort of info at first apt - need to rule out inflammatory arthritis….needs blood tests plus plain xray…Also trial of medication…” “We need to assess further with an x-ray.”
Exercise type			
General exercise	walk (Walking)	✓	“Walking”
General exercise	cycle (Cycling)	✓	“Cycling” “exercise bike”
General exercise	swim (Swimming)	✓	“Swimming”
General exercise	aerobic (Aerobic)	✓	Used if “aerobic exercise” specifically mentioned “All exercise particularly aimed at wt control – i.e. aerobic and fun” “aquaerobics” “cardiovascular” “static CV effort” “exercise to lose weight”
General exercise	inc_mob (Increase mobility +/- activity)	✓	“Increased general mobility” “general increased activity” “^ activity”
General exercise	ADL (Continue activities of daily living)	✓	“Continue general day to day activities” “keep active” “Just keep active”
General	Gen_other (Other general exercises)	×	“rowing machine” “yoga” “‘Keep moving” from ARC’ “pool walking”, “pilates”, “aquaerobics”, “general advice” “keep fit”, “Alexander technique”, “Cross trainer”, “run”, “any”
Unclear	NWB (Non-weight bearing)	✓	“Non-weight bearing”

			[not coded if followed up by examples of exercise recommended – in this case exercises themselves coded]
Unclear	Gym (Gym)	✓	"Gym" [not coded if followed up by examples of exercise recommended – in this case exercises themselves coded]
Unclear	WB (Weight bearing)	✓	"weight bearing" [not coded if followed up by examples of exercise recommended – in this case exercises themselves coded]
Local exercises	quad_stren (Quadriceps strengthening)	✓	"Muscle strengthening" "Quadriceps strengthening exercise" "Leg extensions with medial muscles engaged" "Quads drill" "home quads building exercises" "straight leg raises" "local muscle strengthening" "vastus medialis exercises" "Squats" "quads/hamstring strength" "Passive and active quads. Sliding downwards on to bed on bed (this patient would need to start with latter)" "Static quads/closed kinetic chain (e.g. bike, x-trainer)" "those as per arthritis research UK leaflet" 'NHS inform MSK knee physio tools' [local strengthening exercises only included here] 'Quadricep raises when sitting, lunges' "esistance exercises for gluteals, hamstrings and quads" "VMO exercises" "Cycle in the air"
Local exercises	stretch (Stretches)	✓	"extension" "hamstring stretches"
Local exercises	ROM (Range-of-movement)	✓	"I would show her some exercises to improve the range of motion to her knees" "general flexibility"
Local exercises	Loc_unspec (Unspecified local exercises)	×	Used for respondents where locexY was coded but no further information given. 'knee exercises' 'upper body exercises' 'mainly quads and hams' 'mat work' 'quadriceps exercises' with no further description
Intensity	Gentle (Gentle or low impact)	✓	Term "gentle" "light" "low impact" or "mild" used in description of exercise type "non-stressful/violent exercise" "any exercise that does not exacerbate the pain" "avoid running on hard surfaces" "no running" "not to walk on uneven surfaces"
Tailored	Tailor (Tailored to patients abilities and/or interests)	×	"Anything patient able to do" "Those patient is comfortable with" "management plan with gym trainer" "enjoyable exercise that fits in with lifestyle" "I find it best to encourage any exercise the patient already does" "depends on level of fitness" "if patient has access" "as tolerated" "if tolerated"
Refer Where GPs stated that they 'may' refer, 'if insistent' or 'consider' referral, referral was coded. Where they said 'await xray results…", "if no improvement" etc then referral not coded as not considering it at this time.			
	Physiotherapist	✓	Including "physio" "physiotherapist" "extended scope physiotherapist" "local physio advice line" and reference to self-referral to physio "local MSK service physiotherapist" "physiotherapy via MSK pathway" "Physiotherapy via MSK" "ESP" "Sirona Hip.Knee pathway" [From internet found this is physiotherapy and lifestyle mentoring]

	MSK clinic	✓	MSK services, msk tier 3 services
	Exercise programme	✓	“local exercise referral scheme” “gym” “ local Gym referral scheme”, “exercise on referral (cheap gym membership with a personal trainer session)” “BEEP [physical activity referral scheme]” “exercise on prescriptin”
	Dietician	✓	
	Weight management service	✓	“Practice nurse for weight loss advice” “May do weight loss with health care” “"live well suffolk for weight management and dance” “Health trainer for weight loss”
	Lifestyle	×	“Sirona Hip.Knee pathway” [From internet found this is physiotherapy and lifestyle mentoring], “Health trainer in practice” “In house lifestyle clinic”
	Orthopaedics	✓	“Refer primary community orthopods team consider knee injection” “knee surgeon”
	Occupational health	✓	“exercise on referral (cheap gym membership with a personal trainer session)”
	Other	✓	“ local PALS team” “?CBT” “Inhouse GP with special interest with musculoskeletal conditions”, “colleague GP ?injection”, “My colleague with a special interest”, “ biomechanics” “GPSI sports medicine or sports rehabilitation student”
Barriers to using exercise			
Service-related	Barr_accphys (Difficulty accessing physiotherapy	✓	“Long w/l for physiotherapy” “Usually long waiting list for physio, some patients wait for 3/12 and once they've seen thy've been given a leaflet to do exercise at home, this does not meet pateints expectations” “ Physio not difficult to access, but long waiting list” “ The problem accessing physio is the long waiting time (currently 16 weeks)” “In practice area it takes 3+ months to get appointments on average”
Service-related	Barr_geog (Geographical problems)	×	“Remote location of practice deters patients from travelling to a gym” “Patients are too scared to walk in local area and too poor to access classes (also anxiety about exercise classes 'everybody there will be thin')” “Rural patients - distance to attend physio”
Service-related	Barr_meetexp (Services do not meet expectations)	×	“Usually long waiting list for physio, some patients wait for 3/12 and once they've seen thy've been given a leaflet to do exercise at home, this does not meet pateints expectations” “ Physiotherapy appointments are not long enough. Physiotherapists are very pressurised, they have a massive work load to get through. They do an excellent job” “ Takes 18 weeks to see a physio and then only get 1 session so hard to encourage” “ Only get 2 physio sessions if we refer them” “I do not feel that the local physio service have the time or inclination to approach this problem effectively any more than I do” “physio intervention too brief” “I often find that patients expectations are for more than an exercise sheet. The option of referring whether for physio or to see a specialist or to have an XR is usually the patients priority, rather than listening to my considered opinion”
Service-related	Limitations (Limitations to accessing services)	×	“we are trying to reduce physio referrals and try to give leaflets with exercises prior to referral (as too many referrals expensive…)” “ Pressure on reducing referrals” “ Costs of gym membership - I cannot prescribe exercise/gym so patients often reluctant to pay for this” “ Limited access to non-

			weight bearing exercise such as aquaerobics/hydrotherapy" " Ideally I would like a physio to be part of our team at practice" " Very long waiting lists for MSK though I do give web address of NHS inform to some patients" "physiotherapy and PTIs available in work" "Loss of local fitness initiative" "Lack of community facilities to encourage exercise in older people" "Lack of any facilities in our local area for people to group exercise - no sports or leisure facility. I am unaware of local community groups offering classes" "Patient factors - comorbid problem mental, emotional and social as well as physio" "Lack of easily accessible local opportunities for pateint to access exercise" "Access to exercise support - gym etc" "Cost of exercise to patient e.g. Gym membership" "Comorbidity, domestic environment, transport difficulties, lack of exercise facilities locally"
Service-related	barr_insuftime (Insufficient time in consultations)	✓	" Advise exercises strongly but no time to show them any specific type" " Insufficient time to demonstrate but give leaflet and advice to follow" "Patient often come with a host of problems, of which the knee is just one, so time constraints are biggest problem" "Multiple probs within a 10 min consultation" "personalising plan takes time ! +"
Service-related	Barr_GPcoll (My GP colleagues do not use or value exercises)	✓	
Patient factors	Barr_ptpref (Patients prefer other management options)	✓	"We live in a tablet culture, self management frequently met with reluctance" "Lets face it you don't get to a BMI of 33 by being a keen exerciser. Most people in this scenario won't manage to lose weight or do any exercise they want the pills!" "I often find that patients expectations are for more than an exercise sheet. The option of referring whether for physio or to see a specialist or to have an XR is usually the patients priority, rather than listening to my considered opinion" " When mention physiotherapy and exercise most patients don't want this - 'they just give you exercises and it makes the pain worse'"
Patient factors	Barr_notptexp (Exercise does not match patient needs and/or expectations)	×	"Patients often say they don't have time or it makes it worse. I think they feel physio will do all the hard work for them" "Patient says they feel unable to exercise" "Patients want a 'quick fix' losing weight and increasing exercise is more difficult" "Patient motivation to keep up with exercises" "Patients don't believe you!" "Pts often want - 'quick fix'" "Patient appearing so debilitated by chronic pain that exercise cannot be tolerated" " Main issue is patient belief AND the fact that intial exercise can make pain worse" " Patients find it difficult to comply and slow to make an impact" " Pt feels physically unable to exercise" " Most patients with chn knee pain are overweight and avoid exercises" " Patients sometimes state they've done physio before, reluctant often to do it again" " Patients so overweight that they cannot even consider exercise - in fact this annoys them" "*Some people 'receptive' to such advice others 'eyes glaze over' - just not in their orbit of what they want (as a sufferer myself, I find specific exercises helpful, but admit I don't do them nearly as regularly as I ought)" "Patients see exercsie as harmful & pain as protective" "I advise on quad strengthening, patients often sceptical this is enough to help relieve their symptoms" "Pain + patient weight may

			make exercise difficult” “No barriers except when patient is very elderly/frail and unable to comply” “When mention physiotherapy and exercise most patients don't want this - 'they just give you exercises and it makes the pain worse'” “Many patients unwilling to do anything that involves any discomfort” “Patient refusal to engage with regular exercise due to perceived time constraints and fear of harming themselves” “Patient perceived pain or disability” “Specialist colleagues appear to always want MRI/CT/xray/arthroscopy + people talk to each other (I had this + the specialist did….)” “pts may resist for all sorts of medical reasons + no time/no space/hurts too much etc - we can usually think of something though” ”patients not keen about exercise despite advice as some patients thought their work already giving them too much manual work and hence exercise”
Patient factor	Barr_behavchang (Behaviour change is difficult)	×	“Behaviour change is difficult for patients” “ Very difficult to get many patients to change lifestyle sufficiently to effect enough real change to help knee pain” “ Patient motivation” “some patients are difficult to motivate” “Many pts are lazy!” “patient reluctance” “Requires signficant patient re-education and elements of motivational interviewing so potentially v time consuming”
GP-related factors	barr_insufexp (Insufficient expertise to give detailed information)	✓	“Not the best person” “Physio has greater expertise than I” “Not tried to set frequency + durations for patients regarding exercsies suggested but can see this is sensible. I suppose reason is that I haven't had training in this detailed physio goal setting - will consider in future” “If initial drug therapy not effective to make them active then I would refer to physiotherapy (easy access) to train in exercise techniques better than I ever could”
GP-related factors	Barr_uncer_eff_ex (Uncertainty about the effects of exercise)	✓	”
GP-related factors	GP_no_prior (GP does not prioritise)	×	“Perhaps I should give it a higher priority” “*Some people 'receptive' to such advice others 'eyes glaze over' - just not in their orbit of what they want (as a sufferer myself, I find specific exercises helpful, but admit I don’t do them nearly as regularly as I ought)”
GP-related factors	Barr_noresources (Cannot access necessary resources)	×	“I do not have any readily accessible written information on the exercises” “Lack of structured approach I know the info is out there somewhere - don’t have time or energy to search” “Detailed leaflet sounds good - if I have time I will look at arthritis UK website”
GP-related factors	Barr_unclphysio (Unclear what physio offers)	×	“Little feedback from physiotherapy about advice offered/range of services”
GP-related factors	Barr_uncer_app_ex (Uncertainty about the most appropriate type of execise)	✓	

GP-related factors	Barr_uncer_saf_ex (Uncertainty about the safety of execise)	✓	
No barriers	No_barr	×	[No barriers ticked] “No barriers encountered” “I don’t have a barrier” “No barriers am GP in military with our own physio here” “n/a” “ No barriers - I feel I have the knowledge and the time to manage chronic knee pain effectively and the back up as and when necessary” “I do not have any barriers to providing exercise advice with the help of ARC leaflets” “no barriers” “I try to avoid barriers”
Other	Other_barr	×	“Weight loss” “physiotherapy (referral) needs to be prioritised”
Written info			
N/A	writ_info_patient (Written information from Patient.co.uk or Emis Mentor)	✓	
N/A	writ_info_ARUK (Written information from Arthritis Research UK or Arthritis Care)	✓	
N/A	writ_info_local_phys (Written information from local physiotherapy service)	×	“prepared by local physio dept” “Local physio leaflet” “Leaflet from our physios”
N/A	writ_info_shef	×	
N/A	writ_info_other	×	

Appendix 28: Main survey questionnaire response changes

Respondent ID	Response	Action
Responses under ix_other		
412, 1852	"physio and exercise sheet"	Removed response from Ix_other already coded in *Refer* and response inserted in *Written info*
1338, 1933, 2246, 3637, 4570	"refer to physio"	Removed response from Ix_other already coded in *Refer* (id 2246 had written physio but had -9 in refer y/n box)
1438	"possibly x-ray if pt keen"	Removed response from Ix_other already coded in KXR
1881, 3358	"fasting glucose – check diabetes we are generalists" and "HbA1c – diabetes check/CVD risk"	Removed response from Ix_other and coded in *Blood test*
4714	"physio referral – takes few weeks so would action at this point"	Removed response from Ix_other and inserted detail in *Refer*
760	"if a course of physio didn't benefit then consider xray and bloods"	Removed response from Ix_other as suggested in future not at this point
Responses under rx_other		
4,84, 229, 392, 408,447, 494, 635, 735, 817,879, 1046, 1164, 1207, 1253, 1271, 1473, 1624, 1714, 2034, 2107, 2317, 2507, 2520, 2677, 2679, 2719, 2742, 2901, 3034, 3275, 3280, 3313, 3544, 3569, 3637, 3681, 3831, 3944, 4001, 4125, 4130, 4172, 4193, 4437	"physiotherapy for scoring and exercises" "physiodirect" "Consider physiotherapy - formal assessment" "physiotherapy""?physio" "physio""Physio" "Possible physiotherapy referral review appointment." "Refer to physiotherapy" "Referral for physio/exercise on prescription" "Consider referral to a physio" "Self-refer physio" "Physiotherapy"	Removed response from rx_other and response already included in *Refer*
693, 853, 937,1015, 1374, 1414, 1781, 2267, 2447, 2467, 2826, 3428, 3839, 3841, 4411, 4492, 4508, 4517, 4528, 4599, 4607, 4694, 4878	"Physio" "Discuss with occupational health at work" "Referral to ESP" "Physio referral to manage exercise plan: cycling and swimming likely to help. Probably been doing "the wrong things" in the gym" "Possible physio referral" "Physio" "Possible referral to musculoskeletal podiatry for orthoses if obvious mechanical foot problem e.g. overpronation" "refer PT if quads wasting"	Removed response from rx_other and coded response under *Refer*
948, 1881, 4558	"Physiotherapy – local muscle strengthening" "Often refer to physio for specific advice about strengthening muscles around knee joint. Get her to see the practice nurse for lifestyle ref" "Physio"	Removed response from rx_other response already coded under refer and coded locexY_refer (loxexY already coded as 1)

1268, 1647	“Physio – quads strengthening” “Physio 516nti-inf to get proper advice re exercise for quads”	Removed response from rx_other and coded under refer and locexY_refer already
2157	“Physio ?acupuncture *** and exercise”	Removed response from rx_other already coded under *refer* and *exercise,* coded response for acupuncture
660	“May offer acupuncture esp if intolerant to NSAID”	Recoded as acupuncture
3186	“PPI if an NSAID”	Coded NSAID as being considered
2070	“PIL on quads exercises”	Removed response from rx_other already coded under writ_info and LocexY_leaflet
134,340,492, 2280, 3273, 4870, 4944	“patient information leaflet on OA knee” “knee exercise sheet (Arthritis UK pamphlet)” “Arthritis Research UK knee exercises patient information sheet” “Arthritis research leaflet on knee pain” “Leaflet on knee self exercises” “Self help leaflet of exercises provided by local physiotherapy service” “Information leaflet” “Follow instructions on the patient uk information sheet that I have given him - this includes physical therapy”	Removed response from rx_other and response already included in *writ_info*
233	“Clearly footwear may have a place depending on what has been found. Exercise has been ticked but this would be better considered when he has controlled his pain a bit more and some of the inflammation better. An initial or short use of NSAID with regular simple analgesia would be useful. Clearly realistic time *** are needed the exercise ***** would be **** and part of [arrow up] program”	Not ticked footwear need to change, keep exercise code, NSAID and paracetamol already ticked
325, 1019	“Advice regarding knee exercises possibly with physio referral” “Consider physioreferral assessment/advice re exercises – individually tailored”	Removed response from rx_other and response already included in *Refer and rx_exercise*
352	“Physiotherapy and exercises”	Removed response from rx_other, ticked *rx_exercise* and already included in *refer*
796	“Download AKP exs off intranet, advice on static quads, swim with straight leg kick etc, private physio if she wants”	Removed response from rx_other already included in *refer* and *rx_exercise*
412, 1852	“The language you use really matters – telling people they have arthritis is disastrous”	Remove response from rx_other response already given in rx_exercise, note about language made recoded into *desc_diag_text*
415, 2667, 3471	“to self-refer to physio if these measures not sufficient” “?physio after xray first” “Refer physio if not settling”	Remove response from rx_other and from refer as not going to refer at this point

641	"Information/decision aid (option grid)"	Remove response from rx_other and add code to writ_info_other, although detail already in writ_info_other_text
659, 1086	"Specific exercises to 517nti-infla quads" "Specifically encourage quad and hamstring exercises"	Remove response from rx_other code already present in rx_exercise
660, 2019, 2311, 3168	Response given under rx_other_desc but rx_other not ticked	Code 1 under rx_other
735, 4294	"Note answers given for initial treatment may add in additional treatments at review" "Consider physio/IAI if simple measures ineffective"	Response removed as not describing additional treatments given at this stage
740	"Paracetamol +/- codeine [see above]"	Response removed from rx_other, *wk opioid* already coded and *paracetamol* coded
743,1516, 1730,1861, 1947, 2764, 3242, 4558	"Some/combination of above not all at the same time" "If she wanted pain relief but explain pain relief not that effective for many people" "Await results of x-ray before deciding specific management" "regular rather than prn analgesia" "review if not improving" "Depends on patient needs, sensitivities etc" "Take regular analgesia" "Depends on patient preferences + comorbidities"	Response removed from rx_other as not appropriate as other treatment
1166	"Regular paracetamol +/- NSAIDS topical"	Response removed from rx_other, paracetamol already coded and code added for Top NSAID
1392	"Local 517nti-inflammatory creams PRN"	Response removed from rx_other and code added for top NSAID
1712	"gentle exercise – walking"	Response removed from rx_other, exercise and genexY already coded but added 'gentle exercise' to exercise description under genexY_suggest_desc
2271, 2626, 2742, 2890, 4712, 4806	"quadriceps exercises" "Specific quadriceps exercises" "quads exercises" "Simple quadriceps exercises" "quad exercises" "Quads exercises"	Response removed from rx_other, exercise and locexY already coded
2279	"Assessment by physio ?quads advice ?assessment of gait e.g. is there a foot problem that is exacerbating the knee symptoms but not always –"	Response removed from rx_other and recoded under *Refer, exercise and locexY* already coded but code inserted under locexY_refer
2507, 2548	"Have physio – exercise sheet" "PiL with knee exercises +/- refer physio"	Response removed from rx_other and writ_info and refer already coded
2865	"Low impact activity"	Response removed from rx_other and coded as *exercise* (*genexY* already coded and states low impact)

3073	“unsure why ibuprofen ineffective, should be, try paracetamol, low dose co-codamol, RV after xray”	Response removed from rx_other and coded as paracetamol and weak opioid
3121	“Quads exercises/cycling”	Response removed from rx_other exercise, genexY, genexY description and locexY coded, response added under locexY description
3246	“Hypnotherapy +/- static bike work”	“+/- static bike work” removed from rx_other, exercise, genexY and genexY description already coded appropriately
3283	“physio advice/knee strengthening exercises”	Removed response from rx_other, refer, exercise and locexY_refer already coded, added code to locexY
3295, 4173, 4328	“Quadriceps exercises” “quadriceps strengthening exercises” “provision of leg/knee exercises”	Removed response from rx_other and already coded in exercise and locexY
3335	“Weak opioids – short term only”	Removed response from rx_other and already coded in wk opioid
3358	“Quads exercises + may consider colchicine 0.5g BD in case ****** its intractable pain”	Removed “quads exercises” from rx_other and already coded in exercise and locexY
3372	“Good physiotherapy and ensure pt is shown exercises to build strength in quads”	Removed response from rx_other, locexY and locexY_ref already coded, code added under exercise
3476	“Regular analgesia, patient information leaflet with specific exercises”	Removed response from rx_other and responses already coded under paracetamol and writ_info
3744	“refer to physio for exercise/stretches advice”	Removed response from rx_other and response coded under *exercise* already coded under genexY and genexY refer
3828	“Referral to gym for low impact exercises. Also swimming”	Removed response from rx_other, response coded under exercise and genexY_suggest_desc, response inserted under genexY and genexY_suggest
3850	“Education & information regarding OA. Exactly what I did would completely depend on what patient thought her problem was due to – I would use her ideas to move her towards idea of wt loss/exercise etc”	Removed response from rx_other response already coded under weight loss and exercise and writ_info
3994	“Cod liver oil capsules. Non-wt bearing exercise e.g. swimming. Physiotherapy advice leaflet. Consider 518gmt.518ry ref”	Removed “Non-wt bearing exercise e.g. swimming. Physiotherapy advice leaflet. Consider 518gmt.518ry ref” from rx_other, already coded under writ_info, added podiatry to *refer* code
4052	“Non-weight bearing exercise maintain weight/weight 518gmt..”	Removed from rx_other already coded under *exercise* and *weight loss* and *genexY*

4118	“Step wise approach to analgesia not nec all @ once. Not enough evidence to def push glucosamine etc but some interested in alterative Rx”	Removed from rx_other, analgesia and glucosamine already coded
4366	“A short course of regular NSAID with PPI course – if no improvement after 2 weeks discontinue + ice, wt loss, maintain activity, quads exerc”	Removed all but “PPI”, ice, weight loss, keep active and exercise all coded, locex_demon coded but not locexY – response to this coded
4513	“ARC knee pain leaflet with exercise in physio if patient interested in (sorry “Arthritis Research” now!)”	Removed from rx_other and writ_info and refer already coded
4611, 4667	“physio – quad strengthening” “?physiotherapy – to strengthen quads”	Removed from rx_other, already coded under refer and exercise and locexY_refer, code added to locexY
4631	“Physiotherapy for specific strengthening exercises”	Removed from rx_other, already coded under refer and exercise and locexY, code added to locexY_refer
4774	“Maintain range-of-movement with knee exercises (not for impactful exercise and to avoid repetitive knee bending with impact) offer physiotherapy if symptoms did not improve with management above”	Removed from rx_other already coded under exercise and genexY and locexY
4818	“Quadriceps exercises, discuss with Occ Health”	Removed from rx_other, add Occ health ref to Refer and exercise and locexY already coded
4820	“Topical NSAAID. Paracetamol emphasise on full dose 8 tablets a day. Physiotherapy. Review after physiotherapy discharge letter. Steroid inj”	Removed from rx_other, top NSAID and paracetamol already coded, added code to Refer and Steroid inj
4990	“Physiotherapy - quadriceps knee strengthening”	Removed from rx_other and codes already present in refer, exercise, locexY and locexY_refer
4714	“cod liver oil/ keep active within limitation of pain”	Removed “keep active within limitation of pain” from rx_other and keep active already coded
981	“If symptoms are not improving in the next 3-4 weeks, I would suggest they self refer themselves to the local physiotherapist for some input.”	Removed from rx_other as not a plan for at this point
Responses under refer		
124, 517, 1222, 1280, 1408, 1492, 2761, 2826, 3029, 3079, 3681, 3720, 3766, 3850, 3893, 4395	Response in *refer_text* but no response coded in refer	Code 1 under refer

375, 659, 729, 748, 815, 2840, 3283, 3949, 4118	Response indicates referral would not happen at this time	Code removed from refer and refer_text
2035, 3193, 3485	“Not at this time” “Not at this stage” “Not at this point” “but maybe after results are back-88”	Removed response under response_text and coded -88
4532	“[ticked yes and no and put ? After yes – next to this wrote] physio – depends on what she is expecting/wanting at this stage”	Coded as 1 under refer as referral considered
4979	“physio wait is too long and intervention too brief”	Removed coding from refer_text as refer coded as 0 and coded as barr_accphys, coded “physio intervention too brief’ under barriers_other and barriers_text
322	“Unless patient was very insistent”	Removed descriptive text as refer ticked as no
1308	“But talk about diet wt loss support services”	Removed from refer_desc_other and already coded as weight loss
1046, 3220, 3847, 2137, 4769, 1624, 3180,2340,2826,4051, 3079, 3766, 735, 1253, 3544, 3952, 4532, 84, 193, 229, 247, 313, 359, 365, 405, 429, 625, 693, 740, 817, 943, 1015, 1164, 1195, 1248, 1271, 1277, 1473, 1615, 1652, 1782, 1878, 1901, 1924, 2019, 2245, 2245, 2360, 2421, 2508, 2581, 2679, 2783, 2785, 2812, 2901, 2929, 3003, 3073, 3105, 3243, 3347, 3360, 3375, 3383, 3406, 3435, 3637, 3642, 3819, 3831, 3841, 3844, 4165, 4172, 4291, 4378, 4414, 4528, 4607, 4651, 4772, 4820, 4886	Referral to physio and/or exercise programme suggested but exercise not ticked as a management plan	Code 1 under rx_exercise and change genex and fuex responses to be consistent with this
Written information		
659	Ticked ARUK leaflet but not ticked “written information”	Recoded “written information” as 1
Barriers to using exercise		
176, 1861, 2635, 2842, 3182, 4712	“Long w/l for physiotherapy” “Physio not difficult to access, but long waiting list” “Long waiting time to see physio” “Delay in	Removed coding from *barr_other_text* and recoded under *barr_accphys* if not already coded

	access to physio - can take 12 weeks" "In practice area it takes 3+ months to get appointments on average"	
4,233, 413, 415, 603, 659, 729, 876, 972, 1166, 1392, 1516, 1547, 1881, 2034, 2087, 2133, 2163, 2261, 2467. 2532, 2635, 2842, 2984, 3016, 3088, 3121, 3162, 3168, 3182, 3185, 3292, 3315, 3375, 3565, 3603, 3622, 3747, 3825, 3893, 3947, 3952, 3961, 3982, 4419, 4558, 4619, 4712, 4786, 2483, 981	Given barr_other_text but barr_other not coded	Coded "1" where barr_other_text is given and going to be retained
659	"I give a knee leaflet from ARC to all pt with knee pain"	Removed code from *barr_other_text* as coded under leaflet
603, 1374	"Physio has greater expertise than I", "Not the best person"	Removed code from *barr_other_text* and coded under *barr_insuf_exp*
1392	"Advise exercises strongly but no time to show them any specific type"	Removed code from *barr_other_text* and coded under *barr_insuftime*
1547, 4052, 4786	"Insufficient time to demonstrate but give leaflet and advice to follow" "Patient often come with a host of problems, of which the knee is just one, so time constraints are biggest problem" "Multiple probs within a 10 min consultation" "personalising plan takes time ! +"	Removed code from *barr_other_text* already coded under *barr_insuftime*
2984	"hence giving leaflet out + pt to read and action themselves"	Removed code from *barr_other_text* as coding already present in *barr_insuftime* and *barr_insufexp*
3238, 4285	"Not tried to set frequency + durations for patients regarding exercsies suggested but can see this is sensible. I suppose reason is that I haven't had training in this detailed physio goal setting - will consider in future" "If initial drug therapy not effective to make them active then I would refer to physiotherapy (easy access) to train in exercise techniques better than I ever could"	Removed code from *barr_other_text* and recoded in *barr_insufexp*
3893, 4513, 4619	"We live in a tablet culture, self management frequently met with reluctance" "Lets face it you don't get to a BMI of 33 by being a keen exerciser. Most people in this scenario won't manage to lose	Removed code from *barr_other_text* already coded in *barr_ptpref*

	weight or do any exercise they want the pills!" "suspect pts variable in uptake of advise"	
Responses under genexY_suggest_desc		
541, 2139, 2617, 3114, 3197, 3238, 3885, 3995, 4001, 4294, 4301, 4388, 4395, 4513, 4992	Provided information about the leaflet they have coded they would give rather than general exercise they would suggest '"keep moving" from ARC', '(physios have one we can give out)' "ARC" "ARC knee pain + exercise leaflet" "ARC knee pain Arthritis Research"	Removed code as it referred to leaflet that would be given (as ticked) and ensured coded under writ_info
110, 111, 311, 325, 335, 412, 431, 452, 948, 972, 1086,1132, 1160, 1256, 1612, 1714, 1822, 1910, 1956, 2099, 2163, 2209, 2595, 2857, 2890, 2905, 2992, 3162, 3197, 3295, 3371, 3509, 3519, 3554, 3674, 3694, 3769, 3780, 3825, 3992, 4132, 4135, 4248, 4308, 4328, 4366, 4399, 4508, 4589, 4599, 4601, 4816, 4828, 4842, 4965	Local exercises only mentioned and no other general strategies given e.g. "Passive and active quads. Sliding downwards on to bed on bed (this patient would need to start with latter)" "Predom quads work" "quad and hamstring" "quadriceps building exercises" "quads"	Removed code from genexY_suggest and genexY_suggest_desc already ticked locex (110, 335, 412, 431, 972, 1132,1160, 1256, 1612, 1822, 1956, 2163, 2209, 2209, 2890, 2905, 2992, 3162, 3295, 3371, 3509, 3519, 3554, 3674, 3694, 3780, 3825, 3992, 4132, 4248, 4308, 4328, 4366, 4508, 4589, 4601, 4816, 4828, 4842, 4965) recoded under locex (111, 311, 325,1910, 2595, 2857, 3769, 4135, 4399) [NB If has ticked other actions (e.g. refer or give leaflet) under this section then genexY code retained, if not then removed and locexY code only used]
243, 447, 743, 1073, 1333, 1500, 1548, 2525, 2482, 2845, 2951, 3480, 3932, 4538	Gave only local exercise example and no other actions (leaflet, refer) to promote general exercises and had already coded locexY	Remove code under genex (loxecY already coded) [NB If has ticked other actions (e.g. refer or give leaflet) under this section then genexY code retained, if not then removed and locexY code only used]
1682, 2473, 3340, 4351, 4271, 4966	Gave only local exercise example and no other actions (leaflet, refer) to promote general exercises but had not coded locexY	Removed code from genexY and coded locexY
207, 413, 415, 471, 924, 1084, 1102, 1107, 1166, 1281, 1563, 1763, 1788, 1798, 2034, 2043, 2141, 2159, 2507, 2532, 2742, 3083, 3168, 3278, 3185, 3193,	Gave general and local exercises	Ensured local exercises also coded

3201, 3280, 3409, 3502, 3358, 3680, 3835, 3850, 3893, 3934, 3961, 4097, 4352, 4374, 4487, 4498, 4586, 4833		
254, 760, 1250, 2635, 4118, 4388, 4957, 4992	Details of referral given but no exercises suggested “physiotherapy for early involvement” For this pt of working age group where there are number of years ahead of her perhaps best to refer for physio advice.” “Physio” “refer to the gym”	Retain genexY_suggest code if originally given but code genexY_suggest_desc as -9 and ensured coded under refer
52	“ref depend on degree of disability if cant do his job by responding to emergency in prison will ref on first appointment and make 523rthopaedic take it over”	Code under refer and refer orthopedics
Responses under genexY_other_desc		
1462, 2649, 3238, 4173	Content describes local exercises	Ensure coded under locexY and remove genexY_other code
412, 2372, 3029, 4347	weight loss advice	Remove genexY_other code and already coded under Rx_weight
1166, 1620, 2372, 4366	Gives examples of general exercise	Remove genexY_other code and code under genexY_suggest
235, 244, 275, 354, 562, 603, 619, 815, 853, 937, 1107, 1110, 1140, 1189, 1346, 1414, 1462, 1563, 1597,1954, 1956, 2483, 2604, 2729, 2853, 2875, 2918, 3223, 3262, 3283, 3462, 3463, 3565, 3879, 3905, 3996, 4347, 4436, 4517, 4570, 4866, 4999	Gives referral information	Remove genexY_other code already coded under genexY_refer and refer
4411	“use health trainers for weight loss, and general exercise. Diet sheets. Weight loss clinic in surgery”	Remove genexY_other code, already coded under Rx_weight and genexY_refer and code under refer
3295	“simple analgesia paracetamol ibuprofen”	Remove genexY_other code, already coded under treatment codes
Responses under locexY_other_desc		
603, 796, 1019, 1516, 1620, 2383, 3029, 3283, 3462, 3558, 3562, 3720, 4755	Details of referral given	Ensured coded under locexY_refer and refer, removed coding from locexY_other (if applicable)
1110	“Consider referring to physio but only secondary to general exercise”	Removed locexY codes as only considering using in the future

1140, 1237	“Offer physiotherapy” ‘physio’	Coded locexY_refer already coded under refer
1189, 4881	“Physio according to patient response” “Refer later depending on response”	Removed loxecY_refer code as only considering referring in the future
2762	“For overweight patients - I advise 'pool walking' (in the pool with an inflatable)”	Coded as Gen_other
2866	“General”	Coded as Gen_other, removed locexY codings as no other local exercise info given
3238	“would also recommend local body conditioning classes that include above”	Coded locexY_other
3502	“signpost to website”	Coded locexY_other
FuexY_other_desc		
535, 3193	“review if no improvement 2 weeks” “Allow pt to return after 6wks if insufficient relief”	Removed fuexY_other code and recode under planned follow-up in 2wk and fuexY_opp_fail recoded other daughter codes from -88 to 0 and coded fuexY as 1
3418	“If no improvement - physio referral”	Remove fuexY_other code and recode under FuexY_opp_fail and recode associated parent and daughter codes
Standardise coding		
30, 124, 176, 189, 251, 340, 455, 491, 537, 540, 586, 591, 608, 790, 815, 970, 974, 994, 1207, 1250, 1287, 1387, 1392, 1408, 1454, 1616, 1672, 1982, 2009, 2107, 2131, 2157, 2162, 2280, 2417, 2557, 2686, 2687, 2843, 2875, 2932, 3114, 3226, 3321, 3428, 3508, 3536, 3644, 3691, 3558, 3719, 3823, 3885, 3984, 4011, 4082, 4166, 4290, 4419, 4712, 4881, 4950, 4971, 4975		Coded locexY as daughter codes provided
87, 815, 974, 1566, 1707, 2572, 4579, 4712		Coded locexN as daughter codes provided
3358,3969,411,790,603,153,2447,3973,4828,2034,1569,3720,4001,442,3994,673,4714, 2372, 1160, 2148, 2763, 3085, 3328, 3934, 3982, 4244, 4248, 4308, 4697, 4777, 815, 1682, 4271, 455, 537, 974, 994, 1387, 1672, 2009, 2932, 3321, 3508, 3691, 3823, 4971, 924, 1447, 1910, 3168, 1713, 3997, 970, 3885, 4166, 4419, 4576, 2163, 3246, 3747, 3927, 4957, 4990, 2280, 760, 2265, 2372, 4234, 200, 3238, 4173, 1612, 3262, 4347, 3463, 1073, 1500, 1947, 93, 96, 335, 471, 517, 614, 628, 876, 972, 1019, 1080, 1237, 1403, 1637, 1641, 1763, 1798, 1887, 1900, 2098, 2129, 2139, 2222, 2241, 2688, 2706, 2805, 2865, 2887, 2890, 2905,2993, 3034, 3519, 3554, 3674, 3680, 3755, 3780, 3961, 4118, 4256, 4294, 4362, 4492, 4513, 4583, 4716, 4965, 3283, 2875, 3340, 4351, 4667, 30, 124, 189, 340, 586, 591, 1207, 1250,1392, 1454, 1616, 1707, 2131,2417, 2686, 2816, 3644, 3719, 3828, 3984, 4082, 4290, 4579, 4950, 4975, 111, 413, 1281, 3185, 3769, 4135, 4399, 4611, 4966, 2687, 540, 1686, 3244, 3988		Codec FuexY and/or FuexY_plan if any of daughter codes present and re-coded other daughter codes from -88 to -9 or 0 as appropriate

87, 233, 324, 780, 1398, 1956, 2473, 2572, 2649, 2918, 3485, 4558	Coded FuexN if any of daughter codes present and re-coded other daughter codes from -88 to -9 or 0 as appropriate
3944, 305, 2826, 3239, 169, 4599, 3186, 4052, 149,1207, 3485, 3242	Coded writ_info as source of written info given and recode ‘other text’ and weblink if needed

Appendix 29: Data analysis approaches

Table XXIX-A Summary of main survey data analysis approaches matched to PhD questions

Question no.	Question	Relevant questionnaire item (related element of the underpinning model)	Approach
Primary questions			
1.1	In response to being presented with a case vignette, what proportion of GPs report that they include exercise in the management of CKP? If exercise is included in the management plan, how do GPs state that they initiate and implement this?		
1.1.1	Using a vignette of a patient case, what proportion of GPs report that they would include exercise in their management plan?	Q2.7 (Behaviour)	Descriptive analysis of the proportion of GPs (n(%)) reporting that they would use exercise in the management of a vignette patient
1.1.2	If exercise is suggested, what do GPs report that they actually do to include this in the management strategy?	Q2.8 (Behaviour)	Code and categorise responses for exercise type. Descriptive analysis of types of exercises used
1.1.3	What proportion of GPs reporting to include exercise in the management plan of the vignette patient state that they would follow-up the patient to see if they are undertaking exercise on a regular basis?	Q2.8 (Behaviour)	Descriptive analysis of the proportion of GPs who report that they would follow-up patients to determine on-going use of exercise
1.1.4	Which key factors are associated with the reported use of exercise by GPs?	Unadjusted logistic regression analysis examining association of key variables with use of exercise in management of vignette case	
		Demographic factors Q1.1-1.8 (Characteristic of HCP)	Gender, year qualified, number of GPs in practice, area of practice, personal experience of CKP
		Causal beliefs about CKP Q4.1-4.10 (Beliefs about consequences)	Binary GP responses with agree/strongly agree to statements of causality of CKP (e.g. “being overweight/obese”, “sport”, “manual work”) or not
		Treatment orientation of the GP Q4.11-29 (Beliefs about consequences)	Assessed using responses to the adapted PABS_PT score based on quartiles
		View of severity of symptoms Q2.3 (Beliefs about consequences)	Based on categorisation into very severe/severe, moderate, mild/very mild

		View of severity underlying knee damage Q2.4 (Beliefs about consequences)	Based on categorisation into very severe/severe, moderate, mild/very mild
		Use of x-rays Q2.6 (Beliefs about consequences)	Binary variable used or did not use knee x-ray
		Use of the term 'wear and tear' Q2.2 (Beliefs about consequences)	Binary variable used or did not use term 'wear and tear' in description to patient
		Beliefs about prognosis Q2.5 (Beliefs about consequences)	Description of prognosis to vignette patient to be categorised into solely positive, solely negative, combination of positive and negative and neither positive or negative
		Beliefs about safety and efficacy of exercise Q5.5, Q5.6, Q5.16, Q5.17 (Beliefs about consequences)	Binary GP responses with agree/strongly agree to statements "Quadriceps strengthening exercises for the knee are safe for everybody to do" (Q5.5), "General exercise, for example walking or swimming is safe for everybody to do" (Q5.6), "Increasing the strength of the muscles around the knee stops the knee problems getting worse" (Q5.16) and "Increasing overall activity levels stops the knee problem getting worse" (Q5.17) or not
		Awareness of NICE guidelines Q3.1 (Beliefs about consequences)	Binary variable GP reports having read NICE guidelines (i.e. ticked "I have read the full guideline and/or summary" or "I have read and consider the guideline when planning management" compared with those who have not ticked either of these) or not
1.2	What are the attitudes of GPs towards exercise for CKP?		
1.2.1	What are the characteristics of the biomedical and behavioural treatment orientations of GPs in relation to older adults with CKP according to responses to the adapted PABS_PT?	Q4.11-4.29 (Beliefs about consequences)	Calculate scores and descriptive analysis of the treatment orientation for each individual. Describe the distribution of adapted PABS_PT scores for the study sample using histograms for each treatment orientation.

1.2.2	What proportion of GPs are positive about exercise for CKP when asked to indicate their attitude to exercise use in a scale developed by Holden et al for use with physiotherapists which assessed the attitudes towards the exercise-related statements given in the MOVE consensus guidelines?	Q 5.1-5.17 (Beliefs about consequences, moral norm)	Examine item response distribution using descriptive statistics (i.e. n (%)). Group agree/strongly agree, calculate n(%) and interpret according to: Unamity = 100% Consensus = 75-99% Majority view = 51-74% No consensus = 0-50% Responses to the first six attitude statements were categorised into 'in line' (all six responses are strongly agree), 'broadly in line' (all six responses are agree or strongly agree, but not all strongly agree) and 'not in line' (at least one response is not agree or strongly agree) with exercise guideline recommendations
1.2.3	What proportion of GPs are positive about exercise for CKP when asked to indicate their attitude to the statement "Exercises that may be knee straining should not be avoided"?	Q4.28 (Beliefs about consequences)	Descriptive analysis of the proportion of GPs (n (%)) who largely or totally agree with this statement.
Secondary questions			
2.1	What are the barriers towards using exercise for CKP?		
2.1.1	What proportion of GPs disagree or strongly disagree with statements relating to having enough time to manage patients with CKP, CKP being a priority and CKP being of clinical interest them?	Q3.3, Q3.4, Q3.5 (Beliefs about capabilities, intention)	Descriptive analysis of responses on Likert scale
2.1.2	What proportion of GPs agree or strongly agree with the statements "Time constraints prevent GPs from providing advice on individual exercises for chronic knee pain ", "exercise for CKP should only be used after drug treatment has been tried" and "Exercise for chronic knee pain would be used more frequently if access to physiotherapy was easier"?	Q5.19, Q5.20, Q5.21 (Beliefs about consequences, beliefs about capabilities)	Descriptive analysis of responses on Likert scale

2.1.3	What proportion of GPs respond that they have experienced barriers to using exercise in the management of CKP?	Q3.9 (Beliefs about consequences, beliefs about capabilities)	Descriptive analysis of number of GPs experiences barriers and the nature of the barriers experienced
2.1.4	Is a high score for biomedical orientation according to the adapted PABS_PT associated with not reporting the inclusion of exercise in the vignette patient?	Q4.11-29 (Beliefs about consequences)	See point 2.3.3. using odds ratio it will be possible to establish whether the use of exercise among top and bottom 25% scores in each category are different.
2.2	What do GPs feel their roles are regarding exercise for CKP?		
2.2.1	What proportion of GPs agree or strongly agree that it is part of their job to manage people with CKP and "exercise for CKP is only effectively provided by physiotherapists"?	Q3.2, Q5.18 (Role and identity, beliefs about capabilities)	Descriptive analysis of responses
2.2.2	What are the self-defined roles of GPs regarding exercise for CKP?	Q3.6-3.8 (Role and identity)	Descriptive analysis of responses according to each role identified
2.3	How useful is the adapted PABS_PT for assessing treatment orientation of GPs in the management of CKP?		
2.3.1	What is the level of ambivalence among GPs to each item?	Q4.11-29	Establish the extent of missing data Descriptive analysis to establish frequency of ambivalent responses ('disagree to some extent', 'agree to some extent') to individual items
2.3.2	Is there an inverse relationship between the biomedical and behavioural components?	Q4.11-29	Correlating biomedical and behavioural scores to establish whether there is an inverse relationship using Pearson Correlation Coefficient
2.3.3	Is the GP's treatment orientation, according to the adapted PABS_PT, associated with the use of exercise	Q4.11-29 associated with use of exercise (Q2.7)	Compare exercise use among the most those GPs with the most polarised treatment orientations (i.e. analysis of exercise use in the group of GPs with the top and bottom 25% PABS_PT scores in each subcategory) using logistic regression
2.3.4	Is the GP's orientation, according to PABS_PT, associated with response to MOVE consensus guideline statements advocating exercise?	Q4.11-29 associated with Q5.1-5.7, Q5.14-5.17	Perform ANOVA to establish whether difference in mean scores exists for each treatment orientation according to the extent to which recommended practice regarding exercise is followed
2.4	Does provision of an online electronic response option increase levels of response?		
2.4.1	Is overall response proportion greater than in the pilot survey?		Calculate difference (95% CI) in response to pilot and main survey
2.4.2	Do GPs report that the online response option encouraged them to respond when they otherwise would not have done?	Question at end of electronic questionnaire	Descriptive analysis of frequency of online responses vs postal responses and frequencies with which respondents report they would

	or would not have completed the postal survey had they not had the opportunity to respond electronically

CI = confidence interval; CKP = chronic knee pain; GP = general practitioner; HCP = healthcare professional; NICE = National Institute for Health and Care Excellence

Table XXIX-B Rationale for selection of MOVE consensus attitude statements for assessing extent to which GPs are in line with exercise recommendations

Attitude statement	Rational for section
Selected	
GPs should prescribe quadriceps strengthening exercises to every patient with chronic knee pain	MOVE consensus recommendations highlighted category 4 evidence for the statement 'Prescription of both general and local exercises is an essential, core aspect of management for every patient with...knee OA' (50). Quadriceps strengthening exercises and general exercises are part of core treatment in current NICE guidelines (2). To be in line with best evidence recommendations, both local and general exercises should be included to maximise positive outcomes (8).
GPs should prescribe general exercise, for example, walking or swimming, for every patient with chronic knee pain	
Knee problems are improved by quadriceps strengthening exercises	MOVE consensus recommendations highlighted that there was category 1B evidence to support the statement 'Both strengthening and aerobic exercise can reduce pain and improve function and health status' in patient with knee OA (50). NICE guidelines recommend local and general exercises as core management approaches as they improve 'general motility, function, well-being and self-efficacy' (2). Effect sizes for local and general exercises are outlined in Table 1.4.
Knee problems are improved by general exercise, for example, walking or swimming	
Quadriceps strengthening exercises for the knee are safe for everybody to do	MOVE consensus recommendations highlighted that there was category 4 evidence that there are few contraindications to exercise (50). Studies examining the safety of long-term exercise for knee pain have concluded that exercise appears to be safe in this group (63,64)
General exercise, for example, walking or swimming, is safe for everybody to do	
Not selected	
Exercise for chronic knee pain is most beneficial when it is tailored to meet individual patient needs	MOVE consensus recommendations highlighted that this has not been assessed in clinical trials but has face validity (50). Providing tailored exercise requires additional expertise compared with generic exercise advice. Pilot results indicated that GPs may feel they have insufficient expertise to provide tailored exercise. Therefore responses to this statement may reflect GPs' confidence in providing tailored exercises rather than alignment with recommendations.
A standard set of exercises is sufficient for every patient with chronic knee problems	

GPs should educate chronic knee pain patients about how to change their lifestyle for the better	MOVE consensus recommendations highlighted that the statement 'To be effective exercise programmes should include advice and education to promote a positive lifestyle change with an increase in physical activity' was supported by category 4 (50). Advising patients to increase their overall activity levels is not reflected by the NICE core management recommendations (2).
It is important that people with chronic knee pain increase their overall activity levels	
How well a patient complies with their exercise programme determines how effective it will be	Although MOVE consensus recommendations highlighted there was category 1B evidence supporting adherence as an important predictor of outcome (50), response this attitude statement was not felt to be a strong indicator of whether a GP's attitudes were in line with recommendations or not.
GPs should follow-up patients to monitor extent of continuation of exercises	The MOVE consensus recommendations highlight that there is category 1B evidence to support the statement 'Strategies to improve and maintain adherence should be adopted e.g. long-term monitoring/review...', however, pilot results indicate that the role of GPs in following-up patients may be contentious. Therefore, responses to these attitude statements may reflect beliefs about whose role it is to support exercise adherence rather than whether adherence is important.
It is the patient's own responsibility to continue doing their exercise programme	
Exercise is effective for patients if an x-ray shows severe knee osteoarthritis	The MOVE consensus recommendations highlighted that 'The effectiveness of exercise is independent of the presence or severity of radiographic findings' has category 4 evidence as there is no direct research evidence to support this statement (50). Only one relevant study was identified, this examined change in pain and function from exercise and found outcomes were best among people with less severe loss of medial joint space, no other features on radiographs were examined (50). The value of this item reflecting the extent to which attitudes are in line with recommendations was limited as GPs are encouraged to diagnose CKP without radiographs (2).
Exercise works just as well for everybody, regardless of the amount of pain they have	Current NICE guidelines recommend that people with OA should be advised to exercise regardless of their pain severity (2) and this is supported by a recent systematic review (66). However, because items 1 and 2, above, refer to every patient, including this item to assess treatment recommendations was not necessary.
Increasing the strength of the muscles around the knee stops the knee problem getting worse	The MOVE consensus recommendations highlighted that the statement 'Improvements in muscle strength and proprioception gained from exercise programmes may reduce the progression of knee...OA' has category 4 evidence (50). These items were not included to determine the extent to which GPs' attitudes were in line with recommendations, as items 3 and 4, above, better reflect the content of the current NICE guidelines which refers to exercise 'improving general motility, function, well-being and self-efficacy' rather than preventing deterioration of the underlying condition (2).
Increasing the overall activity levels stops the knee problem getting worse	

Category 1B = At least one randomised controlled trial; Category 4 = Expert committee reports/opinions and/or clinical opinion of respected authorities. CKP = chronic knee pain; GP = general practitioner; NICE = National Institute for Health and Care Excellence; OA = osteoarthritis

Appendix 30: Main survey supporting data tables

Figure XXX-A Reasons for GPs providing MDS responses to the main survey

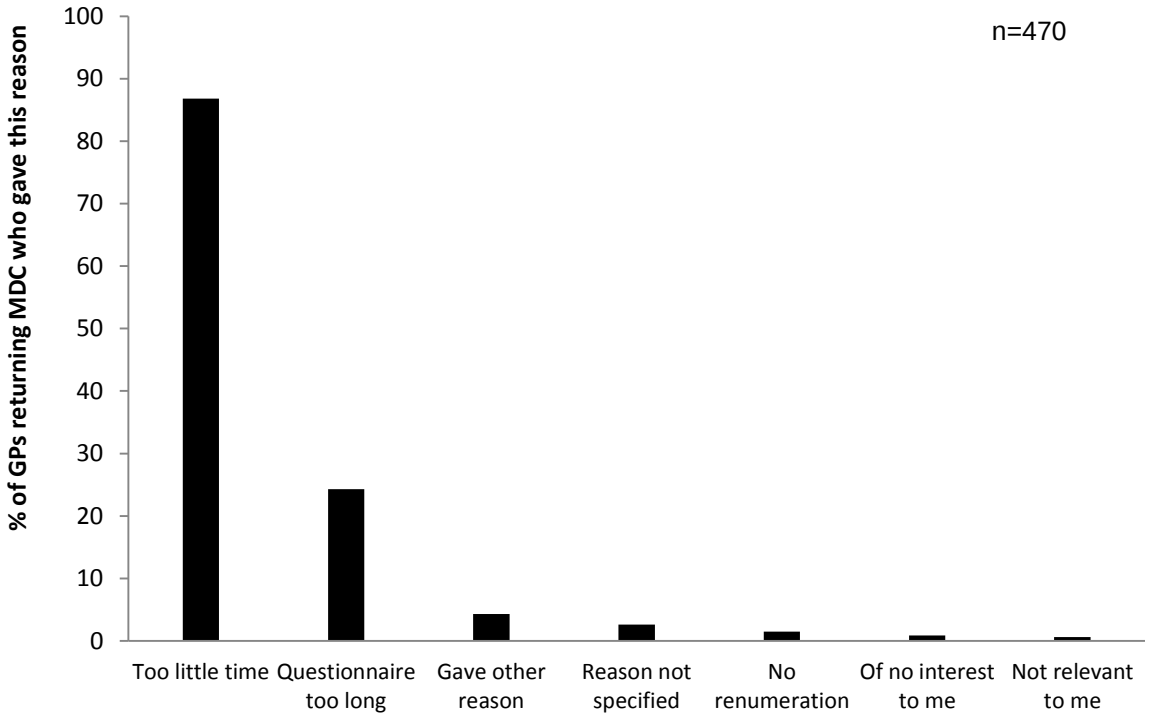

Figure XXX-B Reasons for GPs withdrawing to the main survey

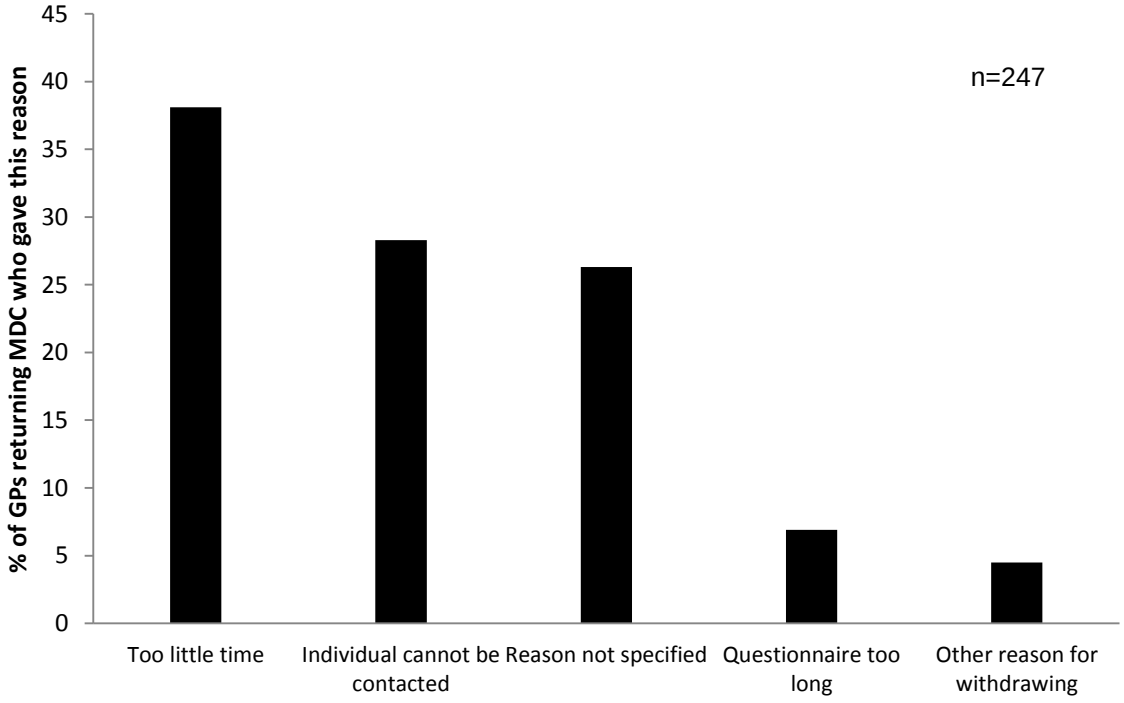

Table XXX-C Response to main survey according to GP's deprivation quintile assessed using practice postcode

	All countries		England (n=4050)		Scotland (n=499)		Wales (n=226)		Northern Ireland (n=158)	
Response?*	**No (%) (n=3630)**	**Yes (%) (n=1303)**	**No (%) (n=2996)**	**Yes (%) (n=1054)**	**No (%) (n=357)**	**Yes (%) (n=142)**	**No (%) (n=154)**	**Yes (%) (n=72)**	**No (%) (n=123)**	**Yes (%) (n=35)**
Most deprived	964 (27%)	302 (23%)	811 (27%)	249 (24%)	79 (22%)	28 (20%)	26 (17%)	17 (24%)	48 (39%)	8 (23%)
OR (95% CI)		*0.72 (0.60,0.87)*		*0.73 (0.59,0.90)*		*0.63 (0.35,1.12)*		*1.31 (0.55,3.12)*		*2.33 (0.27,20.28)*
Second most deprived	798 (22%)	262 (20%)	650 (22%)	196 (19%)	79 (22%)	32 (23%)	44 (29%)	23 (32%)	25 (20%)	11 (32%)
OR (95% CI)		*0.76 (0.62,0.92)*		*0.71 (0.57,0.89)*		*0.71 (0.40,1.27)*		*1.05 (0.47,2.32)*		*6.16 (0.71,52.84)*
Mid-deprived	662 (18%)	287 (22%)	551 (18%)	233 (22%)	67 (19%)	38 (27%)	30 (20%)	15 (21%)	14 (11%)	1 (3%)
OR (95% CI)		*1.00*		*1.00*		*1.00*		*1.00*		*1.00*
Second least deprived	639 (18%)	244 (19%)	519 (17%)	210 (20%)	69 (19%)	20 (14%)	21 (14%)	5 (7%)	30 (24%)	9 (26%)
OR (95% CI)		*0.88 (0.72,1.08)*		*0.96 (0.77,1.19)*		*0.51 (0.27,0.97)*		*0.48 (0.15,1.51)*		*4.20 (0.48,36.46)*
Least deprived	567 (16%)	208 (16%)	465 (16%)	166 (16%)	63 (18%)	24 (17%)	33 (21%)	12 (17%)	6 (5%)	6 (17%)
OR (95% CI)		*0.85 (0.69,1.05)*		*0.84 (0.67,1.07)*		*0.67 (0.36,1.24)*		*0.73 (0.29,1.80)*		*14.00 (1.37,142.89)*

*Response: No = non-responder or withdrawal, Yes = responded with full questionnaire or minimum data

Table XXX-D Difference in type of response to main survey according to GP's deprivation quintile assessed using practice postcode

	All countries		England		Scotland		Wales		Northern Ireland	
Response type	MDS (%) (n=469)	Full (%) (n=834)	MDS (%) (n=375)	Full (%) (n=679)	MDS (%) (n=53)	Full (%) (n=89)	MDS (%) (n=23)	Full (%) (n=49)	MDS (%) (n=18)	Full (%) (n=17)
Most deprived	121 (26%)	181 (22%)	98 (26%)	151 (22%)	9 (17%)	19 (21%)	9 (39%)	8 (16%)	5 (28%)	3 (18%)
OR (95% CI)		*0.63 (0.45,0.89)*		*0.64 (0.43,0.93)*		*1.11 (0.39,3.10)*		*0.22 (0.05,1.08)*		---
Second most deprived	106 (23%)	156 (19%)	77 (21%)	119 (18%)	16 (30%)	16 (18%)	8 (35%)	15 (31%)	5 (28%)	6 (35%)
OR (95% CI)		*0.62 (0.44,0.88)*		*0.64 (0.43,0.95)*		*0.52 (0.20,1.36)*		*0.47 (0.10,2.16)*		---
Mid-deprived	85 (18%)	202 (24%)	68 (18%)	165 (24%)	13 (25%)	25 (28%)	3 (13%)	12 (25%)	1 (6%)	0 (0%)
OR (95% CI)		*1.00*		*1.00*		*1.00*		*1.00*		---
Second least deprived	84 (18%)	160 (19%)	73 (20%)	137 (20 %)	6 (11%)	14 (16%)	1 (9%)	4 (20%)	4 (22%)	5 (29%)
OR (95% CI)		*0.80 (0.56,1.56)*		*0.77 (0.52,1.15)*		*1.21 (0.38,3.90)*		*1.00 (0.08,12.56)*		---
Least deprived	73 (35%)	135 (16%)	59 (16%)	107 (16%)	9 (17%)	15 (17%)	2 (9%)	10 (20%)	3 (17%)	3 (18%)
OR (95% CI)		*0.78 (0.53,1.14)*		*0.75 (0.49,1.14)*		*0.87 (0.30,2.51)*		*1.25 (0.17,9.02)*		---

Full = completed questionnaire; MDS = minimum data set; OR could not be calculated for Northern Ireland

Table XXX-E Use of exercise according to responses to MOVE attitude statements: benefits of exercise

Attitude statement	Response to attitude statement	Using exercise		OR (95%) for use of exercise a priori analysis*	OR (95% CI) for use of exercise a posteriori analysis**
		No	Yes		
GPs should prescribe quadriceps strengthening exercises to every patient with chronic knee pain	Neither disagree or agree	42 (23%)	142 (77%)	1.00	
	(Strongly) disagree	12 (18%)	56 (82%)	1.38 (0.68, 2.81)	1.00
	(Strongly) agree	50 (9%)	520 (91%)	**3.08 (1.96, 4.83)**	**2.23 (1.12, 4.43)**
GPs should prescribe general exercise, for example, walking or swimming, for every patient with chronic knee pain	Neither disagree or agree	17 (25%)	50 (75%)	1.00	
	(Strongly) disagree	3 (13%)	21 (88%)	2.38 (0.63, 8.99)	1.00
	(Strongly) agree	84 (11%)	649 (89%)	**2.63 (1.45, 4.76)**	1.10 (0.32, 3.78)
Knee problems are improved by quadriceps strengthening exercises	Neither disagree or agree	26 (28%)	67 (72%)	1.00	
	(Strongly) disagree	0 (0%)	3 (100%)	----	1.00
	(Strongly) agree	78 (11%)	650 (89%)	**3.23 (1.94, 5.39)**	----
Knee problems are improved by general exercise, for example, walking or swimming	Neither disagree or agree	14 (26%)	40 (74%)	1.00	
	(Strongly) disagree	0 (0%)	4 (100%)	----	1.00
	(Strongly) agree	90 (12%)	676 (88%)	**2.63 (1.38, 5.02)**	----
Quadriceps strengthening exercises for the knee are safe for everybody to do	Neither disagree or agree	44 (18%)	200 (82%)	1.00	
	(Strongly) disagree	15 (13%)	105 (88%)	1.54 (0.82, 2.90)	1.00
	(Strongly) agree	45 (10%)	412 (90%)	**2.01 (1.29, 3.15)**	1.31 (0.70, 2.44)
General exercise, for example, walking or swimming, is safe for everybody to do	Neither disagree or agree	26 (20%)	106 (80%)	1.00	
	(Strongly) disagree	14 (13%)	91 (87%)	1.59 (0.79, 3.24)	1.00
	(Strongly) agree	64 (11%)	519 (89%)	**1.99 (1.21, 3.28)**	1.24 (0.67, 2.32)
Exercise is effective for patients if an x-ray shows severe knee osteoarthritis	Neither disagree or agree	42 (16%)	219 (84%)	1.00	
	(Strongly) disagree	24 (18%)	108 (82%)	0.86 (0.50, 1.50)	1.00
	(Strongly) agree	38 (9%)	391 (91%)	**1.97 (1.24, 3.15)**	**2.29 (1.31, 3.98)**
Exercise works just as well for everybody, regardless of the amount of pain they have	Neither disagree or agree	32 (13%)	207 (87%)	1.00	
	(Strongly) disagree	55 (14%)	349 (86%)	0.98 (0.61, 1.57)	1.00
	(Strongly) agree	17 (9%)	163 (91%)	1.48 (0.80, 2.76)	1.51 (0.85, 2.69)
Increasing the strength of the muscles around the knee stops the knee problem getting worse	Neither disagree or agree	37 (15%)	203 (85%)	1.00	
	(Strongly) disagree	19 (15%)	109 (85%)	1.05 (0.57, 1.91)	1.00
	(Strongly) agree	48 (11%)	408 (90%)	1.55 (0.98, 2.46)	1.48 (0.84, 2.62)
Increasing the overall activity levels stops the knee problem getting worse	Neither disagree or agree	39 (13%)	270 (87%)	1.00	
	(Strongly) disagree	28 (18%)	130 (82%)	0.67 (0.40, 1.14)	1.00
	(Strongly) agree	37 (10%)	318 (90%)	1.24 (0.77, 2.00)	**1.85 (1.09, 3.15)**

*Using neither disagree nor agree as reference category**. ****Using (strongly) disagree as reference category. CI = confidence interval; GP = general practitioner; OR = odds ratio

Table XXX-F Use of exercise according to responses to MOVE attitude statements: delivery of, and adherence to, exercise

Attitude statement	Response to attitude statement	Using exercise		OR (95% CI) for use of exercise a priori analysis*	OR (95% CI) for use of exercise a posteriori analysis**
		No	Yes		
Exercise for chronic knee pain is most beneficial when it is tailored to meet individual patient needs	Neither disagree or agree	13 (18%)	60 (82%)	1.00	
	(Strongly) disagree	0 (0%)	9 (100%)	----	1.00
	(Strongly) agree	91 (12%)	650 (88%)	1.55 (0.82, 2.93)	----
A standard set of exercises is sufficient for every patient with chronic knee problems	Neither disagree or agree	38 (13%)	254 (87%)	1.00	
	(Strongly) disagree	54 (13%)	367 (87%)	1.02 (0.65, 1.59)	1.00
	(Strongly) agree	9 (8%)	99 (92%)	1.65 (0.77, 3.53)	1.62 (0.77, 3.39)
GPs should educate chronic knee pain patients about how to change their lifestyle for the better	Neither disagree or agree	12 (24%)	38 (76%)	1.00	
	(Strongly) disagree	3 (33%)	6 (67%)	0.63 (0.14, 2.92)	1.00
	(Strongly) agree	88 (12%)	676 (89%)	**2.43 (1.22, 4.82)**	3.84 (0.94, 15.63)
It is important that people with chronic knee pain increase their overall activity levels	Neither disagree or agree	17 (22%)	62 (79%)	1.00	
	(Strongly) disagree	5 (50%)	5 (50%)	0.27 (0.07, 1.06)	1.00
	(Strongly) agree	82 (11%)	653 (89%)	**2.18 (1.22, 3.91)**	**7.96 (2.26, 28.09)**
How well a patient complies with their exercise programme determines how effective it will be	Neither disagree or agree	12 (13%)	79 (87%)	1.00	
	(Strongly) disagree	7 (32%)	15 (68%)	**0.33 (0.11, 0.96)**	1.00
	(Strongly) agree	85 (12%)	627 (88%)	1.12 (0.59, 2.14)	**3.44 (1.37, 8.68)**
GPs should follow-up patients to monitor extent of continuation of exercises	Neither disagree or agree	37 (12%)	265 (88%)	1.00	
	(Strongly) disagree	33 (13%)	212 (87%)	0.90 (0.54, 1.48)	1.00
	(Strongly) agree	33 (12%)	243 (88%)	1.03 (0.62, 1.70)	1.15 (0.68, 1.92)
It is the patient's own responsibility to continue doing their exercise programme	Neither disagree or agree	6 (13%)	42 (88%)	1.00	
	(Strongly) disagree	2 (29%)	5 (71%)	0.36 (0.06, 2.27)	1.00
	(Strongly) agree	96 (12%)	675 (88%)	1.00 (0.42, 2.43)	2.81 (0.54, 14.70)

*Using neither disagree nor agree as reference category. **Using (strongly) disagree as reference category. CI = confidence interval; GP = general practitioner; OR = odds ratio

Table XXX-G Use of exercise according to responses to PABS_PT attitude statements: biomedical subscale

Attitude statement	Response to attitude statement	Using exercise		OR (95% CI) for use of exercise a priori analysis*	OR (95% CI) for use of exercise a posteriori analysis**
		No	Yes		
Chronic knee pain indicates the presence of organic injury	Agree/disagree to some extent	68 (13%)	472 (87%)	1.00	
	(Totally or largely) disagree	28 (13%)	189 (87%)	0.97 (0.61, 1.56)	1.00
	(Totally or largely) agree	7 (12%)	53 (88%)	1.09 (0.48, 2.50)	1.12 (0.46, 2.71)
The severity of tissue damage determines the level of pain	Agree/disagree to some extent	50 (15%)	275 (85%)	1.00	
	(Totally or largely) disagree	47 (10%)	425 (90%)	1.64 (1.07, 2.52)	1.00
	(Totally or largely) agree	5 (22%)	18 (78%)	0.66 (0.23, 1.84)	0.40 (0.14, 1.12)
Patients with chronic knee pain should preferably practise only pain free movements	Agree/disagree to some extent	62 (13%)	405 (87%)	1.00	
	(Totally or largely) disagree	34 (11%)	266 (89%)	1.20 (0.77, 1.87)	1.00
	(Totally or largely) agree	7 (14%)	43 (86%)	0.94 (0.41, 2.18)	0.79 (0.33, 1.88)
Increased pain indicates new tissue damage or the spread of existing damage	Agree/disagree to some extent	71 (13%)	485 (87%)	1.00	
	(Totally or largely) disagree	18 (9%)	188 (91%)	1.53 (0.89, 2.63)	1.00
	(Totally or largely) agree	14 (24%)	45 (76%)	0.47 (0.25, 0.90)	0.31 (0.14, 0.67)
If patients complain of pain during exercise, I worry that damage is being caused	Agree/disagree to some extent	68 (14%)	405 (86%)	1.00	
	(Totally or largely) disagree	29 (9%)	295 (91%)	1.71 (1.08, 2.71)	1.00
	(Totally or largely) agree	6 (26%)	17 (74%)	0.48 (0.18, 1.25)	0.28 (0.10, 0.76)
Pain is a nociceptive stimulus, indicating tissue damage	Agree/disagree to some extent	73 (12%)	519 (88%)	1.00	
	(Totally or largely) disagree	11 (11%)	92 (89%)	1.18 (0.60, 2.30)	1.00
	(Totally or largely) agree	16 (14%)	100 (86%)	0.88 (0.49, 1.57)	0.75 (0.33, 1.69)
Pain reduction is a precondition for the restoration of normal functioning	Agree/disagree to some extent	64 (12%)	466 (88%)	1.00	
	(Totally or largely) disagree	13 (13%)	85 (87%)	0.90 (0.47, 1.70)	1.00
	(Totally or largely) agree	26 (13%)	168 (87%)	0.89 (0.54, 1.45)	0.99 (0.48, 2.02)
If therapy does not result in a reduction in chronic knee pain, there is a high risk of severe restrictions in the long term	Agree/disagree to some extent	60 (12%)	455 (88%)	1.00	
	(Totally or largely) disagree	13 (13%)	84 (87%)	0.85 (0.45, 1.62)	1.00
	(Totally or largely) agree	28 (14%)	169 (86%)	0.80 (0.49, 1.29)	0.93 (0.46, 1.90)
If chronic knee pain increases in severity, I immediately adjust the intensity of my treatment accordingly	Agree/disagree to some extent	67 (12%)	506 (88%)	1.00	
	(Totally or largely) disagree	8 (15%)	47 (86%)	0.78 (0.35, 1.72)	1.00
	(Totally or largely) agree	26 (14%)	158 (86%)	0.81 (0.50, 1.31)	1.03 (0.44, 2.44)
In the long run, patients with chronic knee pain have a higher risk of developing severe functional impairments	Agree/disagree to some extent	62 (12%)	443 (88%)	1.00	
	(Totally or largely) disagree	2 (6%)	33 (94%)	2.31 (0.54, 9.86)	1.00
	(Totally or largely) agree	39 (14%)	240 (86%)	0.86 (0.56, 1.32)	0.37 (0.09, 1.62)

*Using agree/disagree to some extent as reference category**. ****Using (totally or largely) disagree as reference category. CI = confidence interval; OR = odds ratio

Table XXX-H Use of exercise according to responses to PABS_PT attitude statements: behavioural subscale

Attitude statement	Response to attitude statement	Using exercise		R (95% CI) for use of exercise a priori analysis*	OR (95% CI) for use of exercise a posteriori analysis**
		No	Yes		
The cause of chronic knee problems is unknown	Agree/disagree to some extent	62 (12%)	442 (88%)	1.00	
	(Totally or largely) disagree	39 (13%)	251 (87%)	0.90 (0.59, 1.39)	1.00
	(Totally or largely) agree	2 (8%)	23 (92%)	1.61 (0.37, 7.01)	1.79 (0.41, 7.88)
There is no effective treatment to eliminate chronic knee problems	Agree/disagree to some extent	48 (14%)	300 (86%)	1.00	
	(Totally or largely) disagree	49 (12%)	376 (89%)	1.23 (0.80, 1.88)	1.00
	(Totally or largely) agree	6 (12%)	43 (88%)	1.15 (0.46, 2.84)	0.93 (0.38, 2.31)
Functional limitations associated with chronic knee problems are the result of psychosocial factors	Agree/disagree to some extent	77 (13%)	529 (87%)	1.00	
	(Totally or largely) disagree	13 (18%)	60 (82%)	0.67 (0.35, 1.28)	1.00
	(Totally or largely) agree	14 (10%)	128 (90%)	1.33 (0.73, 2.43)	1.98 (0.88, 4.47)
Even if the pain has worsened, the intensity of the next treatment can be increased	Agree/disagree to some extent	69 (11%)	543 (89%)	1.00	
	(Totally or largely) disagree	10 (13%)	67 (87%)	0.85 (0.42, 1.73)	1.00
	(Totally or largely) agree	21 (20%)	86 (80%)	0.52 (0.30, 0.89)	0.61 (0.27, 1.39)
Exercises that may be knee straining should <u>not</u> be avoided	Agree/disagree to some extent	66 (12%)	472 (88%)	1.00	
	(Totally or largely) disagree	18 (18%)	82 (82%)	0.64 (0.36, 1.13)	1.00
	(Totally or largely) agree	14 (8%)	152 (92%)	1.52 (0.83, 2.78)	2.38 (1.13, 5.04)
Mental stress can cause chronic knee problems even in the absence of tissue damage	Agree/disagree to some extent	66 (12%)	495 (88%)	1.00	
	(Totally or largely) disagree	12 (14%)	72 (86%)	0.80 (0.41, 1.55)	1.00
	(Totally or largely) agree	25 (14%)	153 (86%)	0.82 (0.50, 1.34)	1.02 (0.49, 2.15)
Therapy may have been successful even if pain remains	Agree/disagree to some extent	63 (14%)	399 (86%)	1.00	
	(Totally or largely) disagree	6 (18%)	28 (82%)	0.74 (0.29, 1.85)	1.00
	(Totally or largely) agree	35 (11%)	296 (89%)	1.34 (0.86, 2.07)	1.81 (0.70, 4.68)
Learning to cope with stress promotes recovery from chronic knee problems	Agree/disagree to some extent	52 (13%)	338 (87%)	1.00	
	(Totally or largely) disagree	2 (14%)	12 (86%)	0.92 (0.20, 4.24)	1.00
	(Totally or largely) agree	49 (12%)	370 (88%)	1.16 (0.77, 1.76)	1.26 (0.27, 5.79)
A patient suffering from a severe chronic knee problem will benefit from physical exercise	Agree/disagree to some extent	38 (16%)	200 (84%)	1.00	
	(Totally or largely) disagree	3 (50%)	3 (50%)	0.19 (0.04, 0.98)	1.00
	(Totally or largely) agree	61 (11%)	520 (90%)	1.62 (1.05, 2.51)	8.53 (1.68, 43.17)

*Using agree/disagree to some extent as reference category**. ****Using (totally or largely) disagree as reference category. CI = confidence interval; OR = odds ratio

Appendix 31: Publications relating to this thesis

Systematic review
Cottrell E, Roddy E, Foster NE. The attitudes, beliefs and behaviours of GPs regarding exercise for chronic knee pain: a systematic review. *BMC Family Practice*. 2010; 11: 4. (Highly Accessed). [Available at: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2826301/]
Pilot survey
Cottrell E, Roddy E, Rathod T, Thomas E, Porcheret M, Foster NE. Maximising response from GPs to questionnaire surveys: do length or incentives make a difference? *BMC Medical Research Methodology*. 2015;15:3. [Available at: http://bmcmedresmethodol.biomedcentral.com/articles/10.1186/1471-2288-15-3]